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S. Hrg. 103-163

NATIONAL ENVIRONMENTAL TECHNOLOGY ACT OF 1993

Y 4. P 96/10: S. HRG. 103-163

National Environmental Technology A...

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

ON

S. 978

A BILL TO ESTABLISH PROGRAMS TO PROMOTE ENVIRONMENTAL TECHNOLOGY, AND FOR OTHER PURPOSES

MAY 21, 1993

Printed for the use of the Committee on Environment and Public Works

OCT 21 1993

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NATIONAL ENVIRONMENTAL TECHNOLOGY ACT OF 1993

FRIDAY, MAY 21, 1993

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 9:40 a.m. in room 406, Dirksen Senate Office Building, Hon. Max Baucus [chairman of the committee] presiding.

Present: Senators Baucus, Moynihan, Lautenberg, Reid, and Kempthorne.

OPENING STATEMENT OF HON. MAX BAUCUS, U.S. SENATOR FROM THE STATE OF MONTANA

Senator BAUCUS. The committee will come to order.

Today we begin hearings on S. 978, the National Environmental Technology Act of 1993. When I introduced this bill earlier this week with Senators Barbara Mikulski and Joe Lieberman, we took an important step toward achieving the twin goals of a healthy environment and a healthy economy. Now, to those who have heard me talk about this before, I'm going to sound like a broken record, but I truly believe that the environment and the economy are two sides of the same coin. After all, sustainable development is the only long-lasting development, and environmental technology is critical in achieving that goal.

The bill before us today takes an important step toward encouraging greater use of environmental technology. Let me say that this bill is on a fast track. In February we held our first hearing on environmental technology, last Tuesday we introduced S. 978, and today we'll hear comments on this legislation from the administration and from key witnesses. It's important to move quickly for two reasons. The first is that the envirotech industry has enormous economic potential. It already employs more Americans than General Motors, and it produces an annual trade surplus of $4 billion. But like so many markets where we once dominated, we can't rest on past accomplishments. Our imports of environmental technology from foreign countries are soaring. Over the last 10 years, the percentage of foreign-made environmental technology used by American companies has doubled, and this trend is continuing not just in the U.S. market, but in other countries as well.

Let me cite just one example of the kind of problem we're up against. Recently, when the Environmental Protection Agency wanted to send some staff to Mexico City to help with their air

quality plan, the State Department blocked the travel request. The Germans and the Japanese weren't so shortsighted. They immediately sent their experts to help design the air quality plan. The day after the plan was complete, German and Japanese technology firms were in Mexico City offering their products, which, miraculously, fit with the air quality plan. This is the kind of cooperation that other countries give their environmental industries. This is the kind of cooperation we need if we are to be world leaders in this market.

Environmental technology can also have a broader benefit. In my view, it represents a golden opportunity to help end the religious war that has divided us for so long on the environment. It brings together good environmental policy with sound economic policy, all for the common good, and that's a winning combination.

As I said, S. 978 will promote the development and use of environmental technology by addressing both the demand side and the supply side. It will do four simple, but long overdue, things. First, it will require the Government to get its act together to develop a national strategy on environmental technology and then review existing programs and budgets in light of that strategy. One of our biggest problems is that we don't have a coordinated national strategy. The Federal Government spends some $4 billion per year on environmental technology-related programs, but no one has looked at the big picture and asked what is worth our investment and what isn't. Before we commit more spending on environmental technology, we need to be sure that we're getting the most from what we already spend.

Second, our bill will help stimulate development of clean-up technologies. It will set aside a small portion of the money the Government spends cleaning up contaminated waste sites for use in developing new methods to clean up these sites faster and cheaper.

Third, the bill establishes an institute at EPA to help develop cutting-edge technology that may not otherwise get off the ground. This is critical for small business, which often faces huge financial hurdles in bringing innovative technologies to market. This institute would use a revolving fund to work in partnership with private companies developing the most promising innovations in environmental technologies.

Finally, the bill has several provisions to help spur demand for environmental technologies. For instance, it will make it easier for a business to use the newest technology to meet current regulations. It will also help small business find environmental technology that suits their special needs. And it will coordinate and approve current export promotion programs to help U.S. companies target opportunities around the world.

This bill can help build a stronger bridge between two of the most important issues facing our Nation today—economic growth and environmental protection—and it will do it in a way that benefits both.

I look forward to hearing from our distinguished witnesses.

Now I'd like to turn to sort of a guiding, almost spiritual leader in pursuing science in this committee, and that's the esteemed Chairman of the Senate Finance Committee and senior Senator from the State of New York, Senator Moynihan.

OPENING STATEMENT OF HON. DANIEL PATRICK MOYNIHAN, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator MOYNIHAN. I'd just so much like to congratulate and thank you for what you're doing. We have in essence a paradigm shift here. We're going to try to move from a command-and-control approach to environmental questions to a criteria-based, risk assessment-based approach. These, in the main—and I think Dr. Gibbons would agree—are legitimate problems which are the fall-out or the accompaniment of technological change. In the main, we've sought to deal with them with common-law approaches that are pre-technological entirely and do not admit to technological verification one way or the other.

The most striking is the relative lack of success we've had with the clean-up of toxic waste sites that began in 1980 in the aftermath of Love Canal and the extraordinary lack of any learning in that whole process. We had in the Love Canal the most striking natural experiment you'd ever conceive of for the effect of toxic waste—people living on top of an area with a street grid that allowed very precise assessments of distance from the main site and the duration of exposure, though nothing got done. The work on broken chromosomes and such was finally just thrown out as hopeless, if not indeed fraudulent, and a decade later we find people making a rational assessment that it's better to litigate indefinitely than to "clean up."

You're trying to see if we can't find rational approaches to what is, after all, a problem susceptible to rational description, and it has to be science-based. Until it is, it will be a religious war between persons who are fundamentally antagonistic, and you are being a peacemaker here, and not a moment too soon.

If I could just make the point that the front page of the New York Times this morning reports that New York State has now, for eight years, had a commission that was seeking to find a place to store low-level radioactive waste, the kind of waste generated by hospital operating rooms, and hasn't been able to do so, has been shipping its waste to South Carolina, South Carolina says, "No more," and in the end, we may find ourselves closing down hospital operating rooms because we can't handle the disposal of the waste, the risk of which we can't assess—people probably have a much greater sense of the real risk involved—and the whole system will back up.

You're trying to unclog it, and you are doing an enormous service, and I congratulate you, Mr. Chairman.

Senator BAUCUS. Thank you, Senator.

Senator Kempthorne, any comments you might have?

Senator KEMPTHORNE. Mr. Chairman, thank you. I would just state that I certainly agree that we need to work toward the development of our environmental technologies in achieving our long-range goals for the environment and for the economy, and I certainly look forward to the discussion we'll have this morning with our distinguished panel.

Thank you, Mr. Chairman.

Senator BAUCUS. Thank you, Senator.

Senator Lautenberg?

OPENING STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator LAUTENBERG. Thank you, Mr. Chairman, and I welcome our guests this morning. Environmental technology, we all agree, is enormously important for protecting the environment, creating jobs, and I'm proud that my State, New Jersey, is a leader in the field, and I'm proud to be a co-sponsor of the bill that Senator Baucus put forward.

Earlier this week I introduced another bill, called the Global GreenTech Jobs Initiative Act, which relates to much of what we're discussing today. The focus of my bill is environmental technology exports. It's designed to give United States environmental firms the boost that they need to capture the enormous market worldwide for environmental goods, services, and technologies.

In brief, my bill does four things. It directs the EPA to collect information on environmental technologies, particularly those that are lower-cost. It directs the EPA, in conjunction with the Agency for International Development, to identify environmental projects in foreign countries that could benefit from our know-how. The agencies must then establish financial mechanisms to increase the participation of American businesses in supplying environmental goods, services, and technologies to developing nations. It provides environmental training to foreign service commercial officers so that they can offer real on-the-ground assistance to American exporters. And it establishes an Environmental Export Information Center, a one-stop center where American businesses can obtain the information necessary on sources of financial and technical assistance, environmental needs of other countries, specific markets for American exports, and the names of business contacts in other countries who could assist U.S. exporters.

Like most members of this panel, I couldn't agree more about the importance of R&D, but I, as a former businessman, also know the importance of selling what it is that you create, and my bill is designed so that once the environmental technologies are available—and many of them already are—American companies will be able to sell them across the globe. In today's economy, a single mathematical formula ought to be the guide: exports fill jobs.

That occasion ought to be tacked to the wall. It doesn't necessarily have to say "It's the economy, stupid," but that kind of reference is very clear, and we ought to get on with doing something that helps control environmental pollution and, at the same time, creates a market for export and jobs.

Thank you very much, Mr. Chairman. I congratulate you on this bill.

Senator BAUCUS. Thank you very much, Senator.

Senators Lieberman and Jeffords have submitted statements for the record and, without objection, they will be included.

[The statements referred to follow:]

STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

I would like to thank the Chairman for calling this hearing and for his leadership on the National Environmental Technology Act of 1993. Senator Baucus, Senator Mikulski and I have worked together to develop a comprehensive environmental

technology bill. Both Senator Mikulski and I had previously introduced environmental technology bills. We have now combined our efforts and, I think, in this case the whole is greater than the sum of the parts. If we are to help make America a leader in environmental technology, we need to take a comprehensive approach.

This bill will address two big concerns of the American people—the environment and the economy. Innovative environmental technologies can save American companies money, increase U.S. exports, create jobs and help ensure a healthy, productive environment. These are benefits that will help Americans, but the fact is that the benefits of American leadership in environmental technology would be global. As we seek to meet the needs of a rapidly growing world population while maintaining the health of the planet, technological advances will be critical. The question is not whether we need a national environmental technology program, but what it should look like. This hearing should help us answer that question.

We need to act quickly. The worldwide demand for consumer goods—for cars, refrigerators, air conditioners, computers—is increasingly shaped by environmental concerns, and American products will have to be cleaner and more energy efficient to compete successfully for market share. Likewise, the demand for pollution control and environmental cleanup equipment is growing rapidly. The Congressional Office of Technology Assessment estimates that the global market for environmental goods and services will reach $300 billion by the year 2000. As the global markets for environmentally beneficial products expand, American companies must capture their fare share.

I have seen first-hand what the lack of U.S. government commitment to clean environmental technologies can mean. With its highly skilled work force, my home state of Connecticut is poised to be a leader in environmental technology. For example, Connecticut is the home of two of America's fuel cell manufactures. Fuel-cells have several environmental advantages. They are excellent energy producers, reaching efficiencies of over 80 percent if heat is recovered, compared to about 30 percent for traditional power plants. They are also virtually pollution-free. But these companies have not had the support that a sensible technology policy could offer. Fuel cells are on the brink of commercialization, but our government is not acting aggressively enough to help business bring this product to market. Meanwhile, fuel cells and other alternative energy industries are being targeted as part of a strong energy and economic policy in Japan—a policy that includes government support for the commercialization process. That should come as no surprise to us, but it should serve as a warning.

This bill is fully consistent with our efforts to reinvent government. Several provisions in the bill will streamline existing government programs and make them better serve public needs.

Title I establishes an inter-agency panel to set clear, government-wide priorities for environmental technology programs and improve government accountability and efficiency.

- The environmental technology institute at EPA, established in Title II, will serve as a one-stop-shop for environmental technology, linking environmental technology developers with users both at home and abroad.
- Title IV directs EPA and the Commerce Department to work together to provide environmental services to small and medium-sized business through the Commerce Department's Manufacturing Technology Centers. There are only 7 such Centers today, but the Clinton Administration has proposed establishing over 100 Centers around the country in the next four years. The legislation would build environmental considerations into the Centers at the outset of this expansion.
- Finally, the bill will, over the long term, reduce the Federal government's cleanup costs. Title III establishes an Environmental Innovation Research program, modeled on the highly successful Small Business Innovation and Research (SBIR) program, that would reinvest a small percentage of government cleanup funds (1.25%) in environmental technology development and commercialization. Over the long term, setting aside a small portion of our cleanup funds for technology development should significantly reduce the cost to both the Federal government and private industry of cleaning up contaminated sites, and should improve cleanup results.

This bill will help make America a leader in environmental technology. It is carefully structured to substantially increase government support of environmental technology without increasing government bureaucracy. It is government working as a catalyst to promote private sector development of socially beneficial technologies, and to make sure that the environmentally clean technologies of tomorrow are being created right here in America today.

TESTIMONY OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Mr. Chairman:

Thank you for the opportunity to testify today. Our ability to sell our environmental products here and abroad is very important. We have a unique opportunity to expand our export sales; an opportunity I hope we don't let slip away.

I have only had an opportunity to briefly review the Chairman's bill as well as those of Sen. Lautenburg and Sen. Kerry. Rather than comment specifically on these bills, I would like to make a few general comments. The first is that we need to approach this market in a new way. One of the main problems business has told me they have with the Executive Branch is that what they need is spread across many different Agencies. The same is true of Congress. It is my hope that rather than each committee working independently, that we can all sit down with business and develop a unified bill. I have suggested such an approach to the Administration.

There's been a lot of discussion of the need to create new pollution control technologies. Much of the world, and indeed many of our own towns, still needs existing technology. As such, the focus of our efforts should be on helping our existing manufacturers sell their existing products. We can do this both by providing a stable domestic market for their goods as well as by providing assistance to them in breaking into international markets.

Wind energy is an excellent example of a technology we could dominate the world market. We are leaders in this area now, but with only a limited domestic market to support marketing and product development, it will be tough to maintain this lead.

In addition, technology exists in this country today to sort dry cell batteries for recycling, an area Sen. Lautenburg and I have great interest. The military literally uses millions and millions of dry cell batteries that could be recycled, but so far they have been unwilling to even test this technology. A quick resolution by this committee to the Army Corps of Engineers to test this technology could significantly help U.S. suppliers of this technology. If we have such a strong need for this technology and won't test it, what signal does this send to the market?

Because the world largely needs existing technologies, at least for pollution control, I am somewhat skeptical of new government research programs. Historically, when we have created programs to foster new environmental technologies, such as the old construction grants innovative and alternative technology program, we have had to offer incentives to get potential customers to even try new technologies. Any effort to promote new technologies must include incentives for potential customers to try these technologies. Disincentives must also be addressed.

Liability is one major disincentive. Innovation is risky. If someone buys a product and it doesn't work, not only may they be out the cost of the product, but they may also be subject to fines and penalties for non-compliance. Even if EPA does not take action against a violator trying to make a new technology work, there is no guarantee that a competitor might not try to abuse citizen suit provisions in an effort to gain business advantage. It seems to me that if there is a new promising technology, we should be able to offer some form of indemnification for noncompliance while the bugs are worked out.

I will stop at this point and ask that a further analysis on environmental technologies by my office be inserted in the record. I thank my colleagues for their time and look forward to working with them on this issue.

Sen. James Jeffords
VERMONT

ENVIRONMENTAL TECHNOLOGIES

INTRODUCTION

Over the past year, there has been growing interest in the role environmental technologies can play in our economy. The impression often seems to be that dominating the world market for environmental services and products can lead us to economic prosperity. An analysis of this market, however, suggests that such is not the case. While any additional export sales are good, environmental technologies are not the cure-all for our economy. The market is not as big as it appears, nor will it be easy for U.S. firms to dominate this market. **But, even though environmental technologies are not going to revitalize our economy, we should not let this market slip away.**

HOW BIG IS THE MARKET?

Estimates of the size of the global environment market vary, but a fair general estimate is around $200-300 billion with an annual growth rate of 4 to 7%. At first glance, this looks like a very sizable and promising market. Aggregate numbers are deceptive, however. **The market is not as big as it appears.**

The market available for American companies is significantly smaller, roughly $8 billion. For comparison purposes, our GDP is about $5.6 trillion; thus, $8 billion represents about 0.14% of our GDP. In terms of exports, however, environmental technologies could make a more significant contribution. Exports total roughly $400 billion. Environmental technologies could potentially represent about 2% of our export market.

So if the demand is so great, why is the market smaller than it appears? Because only a relatively small percentage of pollution control costs are associated with the equipment and services (know-how) that can be exported, i.e. you can export a compactor, you cannot export a landfill. Only approximately 15% of the cost of a water or wastewater treatment system is for capital equipment, e.g., pumps, valves, control systems. The remaining 85% of the costs include such items as labor, land, and cement which will be provided locally. The demand is great, the supply is local.

WHO ARE THE CUSTOMERS AND WHAT ARE THEIR NEEDS?

Roughly 85% of the market for environmental technologies will be in the 24 OECD nations (Table 1). The Less Developed and Newly Industrialized Countries (LDC's and NIC's, respectively)

Table 1. OECD Countries - Roughly 85% of World Environmental Market.

Australia	**France**	**Japan**	**Spain**
Austria	**Germany**	**Luxemburg**	**Sweden**
Belgium	**Greece**	**Netherlands**	**Switzerland**
Canada	**Iceland**	**New Zealand**	**Turkey**
Denmark	**Ireland**	**Norway**	**United Kingdom**
Finland	**Italy**	**Portugal**	**United States**

comprise much of the remaining 15% of the market. The growth rate in demand varies widely between countries. The domestic market for environmental products and services is expected to grow at a rate of about 5%, in Japan - 6.7%, Eastern Europe and the former USSR - 4%, Spain and Portugal - 7%.

In some developing countries (e.g., Mexico), the environmental market may grow at double digit rates. Achieving these double digit rates, however, will depend upon foreign aid. Until a country's per capita income reaches about $4,000, the internal financial resources are not sufficient to purchase much environmental equipment. Japan has recognized this and is using its foreign aid to buy market share for its manufacturers as well as to extend its political influence. Our efforts are small compared to those of the Japanese. Efforts to direct significant foreign aid to any one market area would likely be met with strong resistance from supporters of other U.S. industry segments.

Given that the OECD countries comprise 85% of the market, exactly what technologies will they be buying? **Water and wastewater treatment equipment and services comprise the largest market component, followed by waste management** (Table 2). It is important to note that the numbers presented in Table 2 are aggregate totals which include labor, land, cement, etc. (see previous discussion). These numbers do not represent the potential size of the export market.

The LDC's and NIC's also mostly need water and wastewater treatment. Even though the decade of the 1980's was the United Nation's water decade, little progress was made toward providing safe drinking water to the world's people. One need only look at the difficulty many American towns have had trying to build drinking water infrastructure to see that providing safe drinking water is not necessarily easy or inexpensive. The LDC's and NIC's don't have the money to provide for safe drinking water; thus, assistance from the industrialized world will be needed. With foreign assistance, the markets of these countries are estimated to grow at rates of 20% or more. **A targeted foreign aid program could gain us entry into the future markets offered by LDC's and NIC's.**

What Technologies are Needed?

Proposals have been circulated or discussed to foster new environmental technologies through new government research programs. The implication seems to be that it is "cutting edge" technologies

Table 2. OECD Countries Environmental Product Market.

	Total	N. America	Europe	Japan
		(Percent of Expenditures)		
Capital Expenditures[a]	76	74	76	79
Water/Wastewater	29[b]	24	34	22
Waste Management	21	25	15	22
Air	15	12	17	25
Other (e.g. noise)	11	13	10	10
General Services	24	26	24	21

[a]total capital cost, a small portion of which will be for equipment, i.e. potential export items.
[b]e.g., 29% of total OECD expenditures will be for water/wastewater.

that are needed. With respect to pollution control technologies, the exact opposite is true. **Most of the technologies needed are conventional, well-known technologies.**

Much of the world's wastewater and drinking water are not treated at all. While our research is directed to removing the last 5% of pollution, our customers still need to get out the first 95% of the pollution. Their wastewater and drinking water will be treated in conventional plants. These technologies are neither high-tech nor innovative, what they are is proven. Filtration, clarification, and disinfection are well-known processes used by all industrialized nations. Many countries around the world make the components of these systems, so competition will be fierce.

Furthermore, with all the emphasis on innovative technologies, **have we forgotten the concept of appropriate technology?** The standard treatment technologies may not be appropriate for LDC's and NIC's. Conventional treatment plants are not simple to operate and can be as complex as a chemical plant. Chemical plants have the advantage, however, of being able to control the inputs to the plant. Wastewater treatment plant designers and operators have no such protection. Whatever comes down the sewer must be treated and rendered "pure."

In many LDC's and NIC's, indeed in many American communities, what works best are not the standard treatment schemes, but low-technology treatment systems, such as land treatment, lagoon, or aquatic treatment systems. These systems rely more on nature than on equipment. In both small American towns and LDC's/NIC's, the ability to repair or operate more complex treatment systems is limited. Natural or other low-tech treatment systems are thus more "appropriate" for the available personnel and equipment infrastructure.

The advantage of appropriate technologies is also their disadvantage (from an export standpoint): they are not capital or equipment intensive; thus, there is little to export other than American know-how. New technology research programs are unlikely to prepare us to better compete in this area. In terms of know-how, we are probably the world leaders in these technologies. Unfortunately, those most familiar with the American market for low-tech systems (generally smaller towns) are often those most unfamiliar with global markets. These individuals do not need new technology programs to sell their services, they need one-on-one assistance in how to compete in the global market.

Who Owns the Technologies the World Needs?

In too many cases, not us. There appears to be a general perception here that the United States is the leader in environ-mental technologies. In many cases, that perception is false. Many technologies used here are licensed or purchased from foreign companies or are made by manufacturers recently purchased by foreign companies. **For example, roughly 70% of air pollution control equipment sold here is sold to us by foreign manufacturers.**

A major U.S. air pollution control company was purchased by ABB - a Swiss company which has also purchased several U.S. environmental consulting firms. Many of the patents for sludge dewatering equipment used in the U.S. are owned by European companies. Chlorination, a very important disinfection process for providing safe drinking water, is now dominated by foreign-owned companies. The two largest U.S. chlorinator manufacturers were recently purchased by English investors. The Japanese have invested heavily in our (former) desalination industry. A major U.S. water meter manufacturer was purchased by the French.

We have also lost our edge in some technologies due to our current policies. Incineration is perhaps the best example. Where once we were leaders in this technology, domestic sales have dropped due to negative public and regulatory agency perception about this technology. Without a domestic market to sustain product development, U.S. manufacturers of this technology will have a more difficult time competing in the world market.

In short, our international competitors recognized the global needs long before we did and acted aggressively. What technologies they didn't own, they purchased. Once again, we have fallen behind our competitors. We can catch up, but if we are going to dominate this market, we must find ways to protect our products.

Who Has Information on Foreign Markets?

The U.S. Department of Commerce is the main Federal agency for information on foreign markets. Neither EPA nor the Dept. of State have much expertise in international business. EPA is a regulatory agency, while State serves as our diplomatic representative. The ability of either State or EPA to represent U.S. business interests abroad is limited.

Unfortunately, many U.S. environmental manufacturers are not aware of the information available to them through the Department of Commerce. For example, U.S. businesses interested in the Mexican market can call a 24-hour automated fax information system called Flash Facts. To try this system, call 202-482-4464 and follow the instructions. Use menu code 0101 for a list of available Flash Facts documents (it will be faxed to you in about a half hour; it is easier to get through evenings and weekends).

Have a constituent interested in markets other than Mexico? Commerce compiles the National Trade Data Bank (NTDB). Each month, the NTDB is updated and available to business in the form of a CD-ROM disk. Information compiled by 20 Federal Agencies is all available on this disk which can

be rapidly searched by computer. Business no longer needs to compile and manually skim through reams of data. General information on the NTDB or other issues can be obtained by calling 1-800-USA-TRADE.

Will They Buy From Us?

Even if we own the technology and it's the best technology, we may not be able to penetrate some markets. Eastern Europe is an excellent example. Some eastern European countries may seek to join the EC. By establishing stronger business ties with our western European competitors, eastern European countries may believe they can more easily facilitate their entry into the EC. Thus, they may lean toward our competitors' products.

Financial considerations may also limit our market. The Japanese have strongly targeted South America for environmental sales. Many South American countries do not have sufficient resources to improve their environmental infrastructure. Thus, the Japanese have stepped in with massive aid. In return for Japanese aid, concessions are obtained regarding the purchase of Japanese equipment. These efforts establish a market presence on which Japanese companies can build. South American environmental officials become more familiar with Japanese equipment, and people often buy what they are familiar with. As American automobile companies have learned, it is often difficult to get the consumer to change brand allegiance even when we make the better product. **We need to establish allegiance to American equipment in other countries before we are frozen out of international markets.**

Are Environmental Technology Sales Good for to Our Economy?

The growing international market for environmental products has been cited as proof that environmental protection is good for the economy. While true, it is not the sales of environmental products that make it so. **Our increased sales of environmental products to our international competitors does not mean our economy will be revitalized or that our industry will be better able to compete on the world market.** As previously noted, the potential sales represent a small increase in our exports and GNP. The direct effect on our economy of these sales will be very small. Indirect effects will be more significant.

The keys to the answer include the types of technologies are being sold, the government requirements in place, and the means used to fund the improvements in environmental infrastructure. Pollution prevention technologies are being sold largely because they are cost-effective. They reduce waste of raw materials which reduces pollution while making manufacturing more profitable. Increased domestic sales of pollution prevention technologies can make us more competitive in the international market. Conversely, if we then in turn sell these technologies abroad, our competitors will be able to operate more efficiently and thereby pose stiffer competition to our manufacturers. Thus, increased pollution prevention here helps our competitiveness, while export

Table 3. Comparison of Public-Private Environmental Spending by Region (1990).

Region	1990 Spending ($billion)	Percentage of Spending	
		Public	Private
United States	112.7	30-40	60-70
Canada	10.0	40-50	50-60
Mexico	2.1	60-70	30-40
Europe/UK	51.6	50-60	40-50
Pacific Rim	3.5	70-80	20-30
Australia	2.9	50-60	40-50

Source: W.T. Lorenz & Co.

of these technologies can hurt our competitiveness.

The effect of increased international sales of pollution control technologies on our economy is also not straight-forward. The costs of environmental compliance is a sensitive business and political issue. Opponents of increased domestic environmental protection here argue that new standards make it more difficult for American businesses to compete. Environmentalists acknowledge this concern in their opposition to the North American Free Trade Agreement. Environmentalists fear that business will flock to Mexico to take advantage of weaker environmental standards.

Because it is costly, business generally does not invest in waste treatment technologies unless required to do so. Government regulations are the driving force for the pollution control market. To the extent that governments enact and enforce environmental standards, our international competitors' costs of business will increase. The competitive gap could potentially close. **But, just because other countries improve their environmental standards, this does not mean that their businesses will have internalized the costs of environmental protection.**

In this country, we require industries to pay for pollution control via our so-called Polluter Pays concept. If these conditions are not met (e.g., failure to comply with or enforce pretreatment programs), EPA fines the violators. Such is not the case around the world.

Other countries rely more heavily on a Society Pays concept (Table 3). Mostly public funds are used to build new treatment plants. Industries are then allowed to discharge into public sewers thereby using public treatment plants for their wastes. Depending on the financial arrangements with the treatment plant (e.g., sewer use fees), some portion or all of the manufacturer's treatment costs may be underwritten by the public. The cost of pollution has not been internalized.

If we are to maintain a Polluter Pays approach here and remain competitive, we must push for it abroad. Otherwise, our competitors have an economic advantage. We should begin here. Via our foreign aid programs, we are helping finance treatment works in other countries. **To the extent we do not require that treatment plants built with our money adopt a Polluter Pays approach, we are hurting our own industries.** We are, in effect, subsidizing foreign industries' treatment costs, not internalizing their costs. Worse, we are taking scarce money we could use here to improve our infrastructure and competitiveness for this purpose.

Improving environmental protection abroad is not enough; we must do it in a manner which will help, or at least not hurt, our business. Just because a country improves its environmental protection, it does not mean they are doing so in a manner which will make our business more competitive. We must keep this in mind when trying to improve other countries' standards.

Do We Need a New Technology Research program?

Given that most products sold will be either conventional or "appropriate" technologies, the merits of a new federal research program are questionable. Environmental equipment manufacturers are nearly unanimous in their belief that they have the products the world needs now. Regardless, political momentum for such programs seems to be growing. **Before undertaking any new technology programs, Congress should ask how successful have the past efforts been?**

In the 1970's, Congress created the Innovative and Alternative (I/A) Technology program for wastewater treatment as part of the Construction Grants program. The I/A program was created to help foster the development of new treatment technologies. Innovative technologies were "new", while alternative technologies were not new, but were not the conventional processes used by most cities at that time. In creating this program, **Congress recognized that potential purchasers of "new" technologies might be reluctant to be among the first to buy the technologies. Thus, increased federal funding was given to communities selecting such technologies.** As a further incentive, the promise was made that if these technologies failed, the communities were given the promise of 100% modification/replacement (M/R) funding. Many communities with failed I/A technologies later found that collecting on the 100% M/R funding promise was not easy.

In the 1980's, Congress create the SITE (Superfund Innovative Technology Evaluation) Program to help develop "new" cleanup technologies. EPA contributed money for testing and evaluation of the technology. In general, the SITE program has not lead to the widespread implementation of new technologies.

Many of the new technologies, particularly in the I/A program, failed. Innovation is risky. Excluding those technologies of limited application (i.e. tried once and failed), some technologies experienced failure rates of 33% or more. The reported high failure rates may also underestimate the problems with many of these technologies. Excessive operating expense or a lack of reliability often does not rise to the level needed to declare a technology a failure.

So how does one judge whether or not the program was a success? **The best test of our efforts to foster new technologies is to see what technologies are still being purchased without federal incentives (unless we plan to offer the same incentives to our international customers).** Unfortunately, under the State Revolving Loan Fund, states do not collect the kinds of information that would allow one to readily determine which technologies are being used. Anecdotal evidence suggests that only the alternative technologies (e.g., natural treatment systems), not the innovative technologies, are enjoying continued widespread use.

Given the high failure rates, we should also ask the question as to what type of product we want to sell to the world: proven, or innovative and thus potentially risky? **Do we really want to sell risky technologies to the world, or do we want a reputation for reliable products?** Consumers want reliable products.

But suppose we still want to go forward with new technologies? To prove the technology, full-scale systems will have to be built. Who will we find to take the risks? Environmental technologies are not cheap, and few cities or industries have money to risk on helping develop new technologies. If the technology fails, they must then find money to replace it, plus potentially face costly fines for noncompliance. **Congress had to offer significant incentives to get people to try new technologies before; what incentives are we proposing now?** If we want to promote new environmental technologies, perhaps we could do more by examining the liabilities and other disincentives associated with new technologies than by funding a government research program.

Another important issue is intellectual property rights. Suppose we do invent a new technology. How do we protect it? Before undertaking a new research program, Congress should examine how to protect any resulting discoveries. U.S. taxpayer funds should not go to create technologies our competitors will then exploit.

What Can We Do to Help Sell Our Environmental Products?

We have products to sell today; what we lack is the experience needed to sell them in the world market. Legislation to create new technologies, bureaucracies, or programs will do little to help sell our products. What our manufacturers need is assistance in penetrating global markets. Starting from ground zero is too expensive for many environmental equipment companies. Federal agencies whose mission it is to help sell American products abroad should start by marketing their services here. If necessary, we should underwrite the costs of such assistance. America's farmers get free on-site assistance and we are world leaders in agricultural exports; why not offer the same to other U.S. businesses?

Gaining entry into international markets is not cheap. Some may have the impression that it is cheap to do business in foreign countries, i.e. the dollar must go a long way in Mexico, etc. Not so. Office space in Mexico City can cost as much or more than that in New York City. Office equipment, like computers, can cost 35% or more than in the U.S. While manufacturing labor rates in other countries may be low, it is not so for the professional ranks. In general, it can cost much more to do business in another country than here. Many U.S. companies may need financial assistance to gain entrance into this export market.

It's who you know that counts. Local connections are often crucial to gaining entry into the market. Making such connections can be difficult. Why not bring prospective customers here for training on the use of U.S. equipment? France has done this for years. People purchase products they know from people they know; let's make them comfortable with our products and people. Our products gain exposure, and our manufacturers acquire more experience in working with their international customers. Conversely, why not also provide funds to allow our manufacturers to exhibit at

international trade shows?

We don't speak the language. Engineers and other scientists often are not proficient in a foreign language. Thus, those most familiar with our products cannot converse easily with our new customers. Incentives may be needed to help companies pay for language training. Such incentives will have to recognize that for some companies, time for language training is often as scarce as money.

Our foreign aid could be better targeted towards helping U.S. environmental products gain market share. We can help improve others' lives and help our manufacturers at the same time. Helping our economy while helping others does not diminish the altruistic motives. We can't keep helping people if we don't have a healthy economy. Local labor and materials comprise most of the cost of most pollution control; thus, other countries will benefit significantly from our aid even if we require that the equipment purchased with the aid be ours. On the other hand, not selling our products can create hardship here.

Our foreign aid can be leveraged. Philanthropic organizations as well as consultants and equipment manufacturers are interested in helping other countries protect the environment. Why not package more foreign aid with other U.S. efforts? We can provide more for the same money and thus place more of our products where potential customers can see them.

How can EPA help? EPA is a regulatory agency, not an export agency. We should draw on EPA's existing skills, not try to create new ones. Environmental protection is driven by government. Some countries have little experience with environmental regulation. EPA could provide assistance in this area. EPA can also help our manufacturers and consultants gain exposure through technology transfer programs. These programs should not be used as information dumps, however. Interactive workshops will do more to transfer knowledge (both ways) than simple slide show seminars. Last, EPA can work with the Department of State on monitoring other countries' commitment to environmental protection. We need to make sure our industrial competitors' environmental costs are not being subsidized either by us through our foreign aid or by the country's public infrastructure funding.

Our multi-national corporations can help. U.S. companies doing business abroad can help introduce our environmental products to the world by using U.S. equipment and services as much as possible. When selling products overseas, there's no substitute for experience. By using American products abroad, our multi-national companies can help our manufacturers gain valuable experience.

Senator BAUCUS. Our first panel consists of two very esteemed gentlemen. The first is Dr. John Gibbons, who is Assistant to the President for Science and Technology and is Director of the Office of Science and Technology Policy; and the Honorable Bob Sussman, Deputy Administrator for the Environmental Protection Agency.

Dr. Gibbons, we're very honored to have you here. We have often tried to schedule you here. You're very gracious in wishing to accommodate our schedule. I remember a couple of times you were on the West Coast with the President and the Vice President, so there was a conflict, but we're very honored to have you here and look forward to your views.

STATEMENT OF JOHN H. GIBBONS, ASSISTANT TO THE PRESIDENT FOR SCIENCE AND TECHNOLOGY, AND DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Mr. GIBBONS. Thank you, Mr. Chairman, members of the committee. I'm very pleased to be able to be with you this morning. I've submitted my written statement for the record, but would like to make a few comments.

In reflecting on this occasion this morning, I recalled about a quarter century ago a cartoon in the New Yorker which influenced my decision to move from basic science into science and technology policy. It showed a picture of two people on a busy street corner, briefcase in hand, traffic racing past, and one person said to the other, "You know, the way I see it, there's a tradeoff for everything. You want a high standard of living, you settle for a low quality of life. That's the way it is."

[Laughter.]

Mr. GIBBONS. Now, that, it seems to me, captures in a brief moment what man, believed to be a fundamental dilemma—the sense that economic progress inevitably, results in the lowering of environmental quality. The two things seemed to be coupled in an inextricable way. The reason that was wrong is that in those days we didn't really understand the power of human ingenuity, expressed through technology, to provide goods and services without the traditional, attendant environmental problems.

In the ensuing quarter century, we've seen, the delivery of goods and services in our economy grow even though we use one-third less energy to produce them. Energy conversion, of course, relates quite fundamentally to pollution. We've learned that there's no natural law, outside of entropy, that limits the efficiency with which we can use resources to our ends. We've learned about economic failures in the marketplace that haven't captured these external costs.

We're now far down the road from where we were that time a quarter century ago, when I went through a career transformation. We've learned about the lack of access to good technology on the part of a lot of enterprises, especially small business, and of the public good in providing better access to the power that knowledge gives—that if it's not accessible, it doesn't exist.

We've learned about the manifold opportunities for acquiring goods and services without settling for a lower quality of life. And

we understand that these are shared concerns of both the public and private sectors.

We've learned that these kinds of activities involving environment are embedded in a great variety of agencies and across the various sectors of our economy, especially where energy is transformed. And we've learned that it's not sensible therefore, to entirely focus our efforts and our activities in environmental technology into a single agency or a single institute.

I think these lessons are reflected well in the President's initiatives that were expressed beginning in February at San Jose. Clearly, we have to be concerned about deficit cutting almost above all else. But deficit cutting doesn't just mean reducing expenses. It means providing investments which, in turn, will give us the kind of strength and wealth that will enable us to reduce our deficits in the future.

We do push the notion of investment versus consumption. We are very much committed to the proposition that one can utilize science and technology as an engine for future economic growth, and there are two areas of concentration under that theorem. One is that we should pay a lot of attention to the creation of jobs, as Senator Lautenberg just commented. Getting a blacker bottom line, if it's not accompanied with increased employment, leaves something short in terms of the public concern about the state of our economy. The second area of concentration is that of environmental protection and restoration, whether it be clean-up of our past activities or the reduction of waste streams in the future by getting things straight and using our ingenuity.

The role of pricing is important, we understand. There are a lot less things going into landfills these days because the price of dumping into the landfill is beginning to approach its real cost, and that generates automatic signals upstream that reduce waste. We know that a number of environmental technologies have been rolled into the American industrial economy and that, in many instances, for a number of large corporations, most of these investments have resulted in net profits rather than net costs, simply because they used their smarts to capture these waste streams and turn them into profitable activities.

Now, if you look further into the administration's initiatives, we seek several things I'd like to point out that are relevant to the bill that this committee has introduced. One is that research and development is an activity that does have payoff. It's unpredictable in many ways, especially basic research, but it has an enormous payoff both to the public and private interests. It seems to me, I think as Senator Moynihan just pointed out, that we do need to move to a time in which we can make decisions based on knowledge rather than on suspicions or hunches. That is, research provides more light to replace the heat that has gone into many of these earlier debates and decisions.

We do feel that the whole idea of research and development, rather than being focused in the Federal Government toward very specific mission needs, should be broadened. The basis of the work of the Federal R&D, which is half of the total national R&D, should be more spread out not only to be responsive to mission needs, but also broader national needs. We should see a greater

transparency, for instance, between the Federal laboratories and people in the private sector with innovative ideas so that we can foster more partnerships, consortia, joint ventures where the public interests and the private interests can be clearly identified and aligned.

We see increased emphasis in various of the Federal departments toward technology transfer, technical assistance, assistance in increasing access to international markets. We see the Executive Branch itself attempting to do a better job of integrating and coordinating its efforts across the various agencies. In the area of environmental technology this is particularly important because those technologies are directly relevant to many of the different agencies' needs. Our opportunity to make the whole greater than the sum of the parts is there, and we intend to capture that, especially using the Federal Coordinating Council for Science, Engineering, and Technology that I am in charge of.

We hope that we can, in the coming months, if not years, develop a much more carefully constructed national environmental strategy. This goal was reflected in the President's speech on Earth Day—we need a better framework to think about all the individual activities we're trying to do, a framework in which, again, we try to better capture these opportunities and integrate them into the various activities across the Federal Government. We don't see that it's cost effective to try to concentrate these activities into a single institute or even within the EPA, because they're inherently spread out. Yet we need to orchestrate these activities and integrate them in ways much better than we've done before.

In this vein, we have created a subcommittee to the committee on Earth and Environmental Sciences of FCCSET. The subcommittee is called the subcommittee on Environmental Technology, and it includes 11 agencies, including those listed in this committee's bill. We do have a new multiagency project that is led by EPA to leverage our existing resources across the Federal Government. Our request in fiscal year 1994 is for about $36 million, a substantial portion of which EPA would use to leverage, in a productive way, other activities and resources within the Federal Government.

Now, finally, with respect to S. 978, we certainly commend the committee for their leadership on this issue. It expresses, it seems to us, a very important thing that we all need to be focusing on and thinking about as we move ahead in this area. We most assuredly share your desire to improve the Federal efforts to develop, coordinate, and disseminate environmental technologies, with special emphasis on small business. Unfortunately, since the bill was only introduced earlier this week, the administration has not had time to fully review its contents, so I'm only able to provide some broad responses this morning.

I would say that we are concerned that some of the more prescriptive provisions of the legislation might limit the flexibility of the administration in achieving our, I think clearly recognized now, common goals. Particularly in an area like technology development, it is essential that the agencies have the flexibility needed to take advantage of new opportunities as they arise without being bound by quickly outdated or inappropriate structures or requirements.

For instance, while we welcome the support for an interagency FCCSET committee on environmental technology, such as the one we recently established, having such a committee and its functions specified in detailed legislation could make it more difficult for that committee to function effectively and to respond to changing demands and opportunities.

Another concern is the number of annual reports that would be required by legislation and the Environmental Technology Advisory Council created in the bill, which could prove unnecessary or redundant or perhaps less cost effective than other ways to utilize our scarce resources and time.

We will get back to this committee as quickly as possible with additional comments on the legislation and with suggestions we hope can be used to improve it. I do look forward to working with this committee and the other committees of jurisdiction to perfect the legislation and to implement it. It certainly reflects, at its heart the same desire the administration has to increase our standard of living while holding onto our quality of life.

Thank you, Mr. Chairman.

Senator BAUCUS. Thank you very much, Dr. Gibbons. That's very helpful.

I'd like to turn now to Mr. Sussman.

This is your first time, Mr. Sussman, in an official capacity before the committee, and we're very happy to have you here, and I expect we'll be seeing much more of you in the future. We're interested in hearing what you have to say.

STATEMENT OF HON. ROBERT M. SUSSMAN, DEPUTY ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY

Mr. SUSSMAN. Thank you, Mr. Chairman. In fact, the committee will be seeing me again next week at another hearing. We have submitted to the committee my written statement, and I ask that it be included in the record.

Senator BAUCUS. Without objection, your prepared statement will appear in the record.

Mr. SUSSMAN. I'd like to summarize the key points in my prepared statement. First, I want to say that it is a pleasure to appear today to discuss the important subject of environmental technology. We do want to congratulate the committee and the bill's sponsors for exercising leadership on this critical issue. As you know, technology innovation is of great importance to this Administration and to EPA in particular. As Dr. Gibbons mentioned, the President's 1994 budget request does include a proposal for a new environmental technology initiative, which EPA is very excited about. We believe that the goals of the legislation that we're discussing today are consistent with President Clinton's call for investing in the technological future of America, and we look forward to working with the committee and the bill's sponsors to enhance its provisions and to make it complimentary to our existing programs and initiatives.

Before turning to the bill itself, I'd like to review the administration's initiatives on environmental technology innovation. First, as you recognize, Mr. Chairman, it is our strong view that economic

growth and environmental protection are not only not incompatible, but indeed are complementary. This is nowhere more true than in the area of technological innovation, where we can both promote economic growth and improve protection of the environment.

It is also absolutely critical, for both economic and environmental reasons, that U.S. industry is at the forefront in developing and disseminating environmental solutions to the rest of the world. This is critical not only because environmental technology offers enormous economic opportunities, it's also critical because working with other nations, we can encourage absolutely essential environmental progress around the world.

This Administration has moved swiftly to propose an environmental technology program that will stimulate investments in innovation and also, as Dr. Gibbons stressed, will coordinate environmental technology efforts throughout the Federal Government. The environmental technology initiative in our fiscal year 1994 budget request is, as the committee knows, the initial step in what we hope will be a multiyear initiative to integrate and improve Federal efforts to support environmental technology innovation and diffusion. More broadly, the administration has also established a technology policy initiative, which is being spearheaded by the Vice President.

Finally, on Earth Day, the President asked the Department of Commerce, working closely with EPA and the Department of Energy, to take the initiative in developing an export promotion strategy that would increase exports of U.S. environmental technologies and improve our competitiveness in the growing world market for environmental goods and services.

EPA's primary role in the area of economic environmental technology has been, and will continue to be, to help facilitate technological innovation and disseminate credible technology information. EPA has several unique and important strengths to offer in this regard, and I'd like to summarize them.

First, and most importantly, the environmental technology market is created and driven, in large measure, by the regulatory programs and standards that are set by EPA and State agencies. Therefore, EPA is in a unique position to anticipate future technology needs and to adopt policies as part of its overall environmental management strategy that encourage the development and use of new technologies.

Second, because of EPA's regulatory authority, its involvement in technology development and testing can lend unique credibility to a new technology and, therefore, provide a strong impetus for its ultimate acceptance in the marketplace.

From the perspective of EPA's experience, I would suggest that there are certain basic principles that we should look to in developing policies for environmental technology innovation. First, we need to forge partnerships among Government agencies and with the private sector, as Dr. Gibbons indicated. We've made substantial progress, I think, at building cooperative relationships among Federal agencies. This is a very encouraging development to me, and it's an area where I think we can do more. We also need to develop partnerships with the companies, primarily small entrepre-

neurial companies, that will be the source of future environmental technology innovation.

Second, Government must focus on more than just environmental technology development. Government needs to identify incentives we could use in our environmental management programs to foster innovation, and also Government needs to provide information and other services that will help firms in their innovation diffusion and commercialization.

Third, our efforts must extend beyond pollution control and site remediation. This is a very important point. We need to be supportive of process improvements in industry that will help us capture our waste streams before they're released into the environment and will promote pollution prevention and waste minimization as a preferred strategy for environmental protection.

We look forward, Mr. Chairman, to working with you to achieve the common goals that I've mentioned and to improve the Federal effort to develop and disseminate environmental technologies. For that reason, we support the thrust and direction of many aspects of the proposed bill.

For example, we do believe that EPA's role could be improved by creating a new Office for Environmental Technology similar to the institute which is envisioned in Title II of the bill. We also support the concept behind the environmental innovation research programs provided for in Title III of the bill. We concur with your assessment that helping encourage environmental technology innovation should be a key component of the major environmental cleanup programs not only of EPA, but of other agencies, like DOE and DOD. Third, the testing and reporting programs described in Title III and Title IV of the bill will augment existing efforts to address this barrier to technology development, and we support the goals of this endeavor as well.

Mr. Chairman, while EPA supports the goals of the bill, we do have a number of concerns that we would like to work closely with the committee to resolve. First, we want to make sure that the bill creates——

Senator BAUCUS. If you could just summarize as best you can, Mr. Sussman.

Mr. SUSSMAN. I will.

Senator BAUCUS. Thank you.

Mr. SUSSMAN. That the bill creates a more effective role for Government in the entire technology innovation process. Second, we agree with the bill's focus on increasing the credibility of performance data and enhancing the process for disseminating it. We are concerned, however, that EPA is not well situated to certify performance of all technologies and in all circumstances in which they can be used. These are two concerns we would hope to address with the committee.

I'd like to say in summary that we appreciate the opportunity to comment on this important initiative and congratulate the committee for its effort to give this area the attention that it needs.

Thank you.

Senator BAUCUS. Thank you very much, Mr. Sussman.

I appreciate the general support of the bill. Obviously, there are going to be some details in the bill we're going to have to work out,

and it can certainly be improved upon in many ways, and that's, obviously, the point of this hearing. I thank you very much for your basic support.

A basic question I have is, in your judgment, what are the barriers that either businessmen or others in America face in attempting to accelerate the development of environmental technologies in this country generally? Not only preventive and remedial, but also life-cycle, more generic environmental technologies.

This committee has heard a lot of testimony that the sticks, if you will, of Federal standards and regulations help drive technology. We also hear sometimes that regulations stifles innovation, which prevents more innovative, creative solutions. But I'd like your judgment as to what you think the major barriers are and what the major problems are that prevent faster development and more creative development of environmental technologies in this country.

I'll start with you, Dr. Gibbons.

Mr. GIBBONS. I was just going to defer to my companion, but I'd be happy to give you a brief response. Let me give you one example. By public policy, we are causing a lot of materials to be pulled out of municipal solid waste streams—paper, other materials, glass. But the market demand for those secondary materials has not risen as fast. There's a time element of adjusting to the new supply of secondary materials that we haven't taken into account as well as we perhaps should.

One example of how we might help on that through public policies both at the Federal, State, and local levels is to change our procurement policies. We could provide a market pull for products that use secondary materials and, therefore, help reinforce the notion of pulling these materials out of the waste stream.

Senator BAUCUS. So you think it's Government's role to create demand.

Mr. GIBBONS. I think Government has an important role in creating demand, because Government's own procurements and purchases account for a very significant part of our total economy.

Senator BAUCUS. Mr. Sussman?

Mr. SUSSMAN. Thank you, Mr. Chairman. There are a number of unique attributes of this market sector which I think historically have impeded development of new technology. First, this is a sector where innovation has been driven historically by small companies that are not well financed and need support from the investment community. Unfortunately, venture capitalists have been reluctant, with some exceptions, to commit resources to the development of new technologies.

There are a number of reasons for that, but one primary reason, I think, is that in this market regulatory programs and governmental acceptance are critical in determining whether a new technology will be embraced by technology users. There has been significant uncertainty over the years whether new remediation techniques, for example, would be viewed as satisfactory to meet regulatory requirements, and for that reason venture capitalists have been reluctant to commit resources.

This is one of the reasons why Government assistance at the R&D and pre-commercialization stage could be useful in this area perhaps to a greater extent than in some other sectors.

Senator BAUCUS. I appreciate that.

I guess, Dr. Gibbons, your answer to my question really is not addressed by this bill. This is not a Federal procurement bill.

Mr. GIBBONS. Exactly.

Senator BAUCUS. But I'm wondering if the assumptions behind the provisions in this bill, in your judgment, are also barriers to greater technology developments—namely, lack of coordination among Federal agencies. That's number one. A second assumption is that technologies would come on-line faster if EPA also has a role—not the total role, but a role—in helping guide industries to greater technological development. After all, EPA does provide the stick, if you will, and the thought is that maybe a carrot could help a little, too.

Then, third, there's an assumption behind DARPA. DARPA has been successful in the national security field basically because DOD knows what technologies DOD needs and works with defense contractors to develop those technologies. Beyond that, there's the thought that with 1.25 percent out of the clean-up funds that this Government provides, that could be set aside for smaller companies on a match basis maybe similar to how Sematech operates in the semiconductor development field.

So I'm curious whether the assumptions behind this bill are, in your judgment, also barriers to trade.

Mr. GIBBONS. Yes, I agree with you. As I mentioned in my testimony, the need for small business to access helpful information with respect to environmental technology is an example. Some small companies have clean-up challenges in their own operations and frequently have less than optimum access to help in understanding how they can do this. If you go to Japan or Germany today, with similar environmental laws, the government really is actively assisting businesses in fulfilling the laws. We simply don't do that. Particularly, the idea of Department of Commerce and EPA providing technological assistance is an important concept.

Mr. Sussman's point about assisting entrepreneurs in environmental technology is important. EPA and the Advanced Technology Program at Commerce have missions to provide resources that can, as it were, help create opportunities for people with good ideas and limited capital. Joint ventures with the public or with universities or others can be supported with public funds if the public interest is clearly identifiable.

Senator BAUCUS. I appreciate that. My time has expired.

Senator Moynihan?

Senator MOYNIHAN. I just want to follow up on your remarks, Mr. Chairman. You mentioned that DARPA has had an impressive performance over about 40 years because the military has known what technology it wants. But often political considerations supervene. DARPA knew perfectly well you couldn't produce Star Wars, but the White House thought otherwise, and Hunt Spader could have explained it to anybody who listened in the 1970's or the 1980's. That is, there had gotten to be a pattern at the height of the Cold War in the NSC that they called "threat analysis in

worst-possible-case conditions," and that's what the President had to focus on every day. There's a pattern of threat analysis in worst-possible-case conditions in the environmental world, and it's beginning to produce some responses that I think we should watch.

I would especially suggest to Dr. Gibbons this. Last week there was an Op-Ed piece in the New York Times by Aaron Wildopski just being dismissive of half the Armageddonic pronouncements about species extinction, global warming, and when the Aaron Wildopskis begin to be contemptuous, take note, for it's not for lack of Mother Wit that they are saying what they do. Wildopski makes the elemental point that absent extinction, there's no evolution; that 98 percent of the forests of the Northeast United States has disappeared in three centuries and only three birds.

I'm thinking in terms of what Senator Baucus is trying to get at, the response of the Executive Branch to the NAPAP studies on acid rain, the largest environmental research program in history, giving us more control of the data and, to some extent, technology than anyone has. What the world knows, we know most about this. The only place, to my knowledge—my sense of it—that this information has not been well received is in the Executive Branch of the Federal Government. NAPAP basically came out with good news, which is that as much acidification that was going to take place, has taken place, and the cost of bringing it down will be very large in terms of the benefits that might result.

No one regarded it as good news to hear that you're probably at the end of a cycle, and thanks to the indulgence of the Chairman, I wrote all sorts of matters into the Clean Air Act, that, for example, you ought to give us a list of acidified lakes once a year. You're not going to do that. You wouldn't dream of doing it. It wouldn't be long enough, and how many are adding to?

My point is, do you not think this legislation will help us in regard to a problem which I feel we have and others I know feel we have of exaggerating risk and not understanding?

Mr. GIBBONS. I think people enjoy being frightened sometimes, whether it be by literature or other things. The bizarre is quickest to gain attention, and I think we are guilty of that, whether it be Star Wars or NAPAP. This legislation, I think, goes in the right direction in saying it's time to pull together our knowledge in a more systematic way and devise a strategy that applies appropriate conservatism. We must take account of the things we don't know, which are the most important, and derive from the known and the unknown a national environmental strategy. We have a lot of pieces around, but they've never been put together, it seems to us, in a framework that's as coherent, as cohesive, as our current wisdom as it should.

I would hope that we could talk further about that portion of the bill, because we do believe, as the President stated in his Earth Day speech, that this was an intent. This is not an easy thing to do. As you know, we've had several failed attempts at a national energy strategy, which is far less comprehensive than one would have to be in terms of a national environmental strategy. But the environment is so important to our future and captures so much of our energies and attention that it well merits this kind of careful examination.

Senator MOYNIHAN. Thank you, Doctor. That's what the Chairman has in mind and you being there as part of our family, too, and we very much look forward to that.

Senator BAUCUS. Thank you very much, Senator.

Senator MOYNIHAN. Thank you.

Senator BAUCUS. Senator Kempthorne?

Senator KEMPTHORNE. Thank you, Mr. Chairman.

Mr. Sussman, nice to see you again this morning. Could you describe for me the manner in which EPA and other Government agencies currently make their decisions about which environmental technologies to fund and which to ignore and which to abandon?

Mr. SUSSMAN. Well, that's a large question. I think agencies currently use a number of different approaches to evaluate technologies. Which technologies we focus on right now depends largely on what funding mechanisms we have in place, what statutory mandates we have to implement, and also, in part, on what areas of expertise people at the agency bring to bear. I think that EPA is now promoting a number of very useful technology development efforts, particularly in the remediation area, but I also agree very fully that a comprehensive approach would help us all in looking broadly at the opportunities that exist for technology innovation and setting some good priorities.

Senator KEMPTHORNE. Dr. Gibbons, any further thought on that?

Mr. GIBBONS. Well, I think we have a lot of opportunities to do some things together in a new era of productive partnership between the public and private sectors. As an example, we have Federal lands that are Superfund sites in need of remediation we have an opportunity on those sites, especially because they're within Federal enclaves, not only to clean up, but also to experiment with new technology.

For instance, at the Y–12 plant in Oak Ridge, bioremediation methods were used to clean up some nitrate pits left over from World War II and subsequent years. Those pits have now been cleaned up using special microbes. The clean-up has been done, and new technology has been developed that's quite applicable to such things as mining wastes in other areas.

We have a lot of opportunities to move forward with public-private partnerships that encourage, rather than discourage, innovation. It's time to get on with the field experiments, trials, innovative work, and our own Federal lands provide us ample opportunities for that.

Senator KEMPTHORNE. Well, then, Dr. Gibbons, again with regard to the approach that agencies use regarding environmental technologies and what projects to fund and which ones to not fund, how will this bill either enhance or be detrimental to that process?

Mr. GIBBONS. I think the bill can enhance it if it provides EPA with resources to capitalize on promising situations either in the private sector or in the other Federal agencies that collectively have an enormous amount of environmentally related work going on. EPA can be the catalyst at the margin and multiply the value of those dollars that are put at its disposal.

Senator KEMPTHORNE. The President's budget includes $36 million in 1994 for EPA for development of environmental technology,

and in the Chairman's bill he authorizes $36 million in 1994 for the creation of an environmental technology institute. So, Mr. Sussman, is this new money, or is this an allocation of the $36 million that is currently proposed in the President's budget?

Mr. SUSSMAN. Well, I'm not entirely sure how to answer that. I see the funding authorization in this bill as paralleling the funding proposal in the President's fiscal year 1994 budget, and I see the program that this bill would create and initiate performing many of the functions that the President's environmental technology initiative is seeking to perform. So I see the efforts of this bill and the President's initiative as being very complimentary.

Senator KEMPTHORNE. So would it be the same money, the same $36 million?

Mr. SUSSMAN. Let me get back to you and answer you later.

Senator KEMPTHORNE. All right.

Mr. Chairman, thank you very much.

[The information referred to follows:]

As I stated in my testimony, EPA believes that the goals of the President's Environmental Technology Initiative and S. 978 are consistent with each other. Whatever resources are appropriated by Congress to address the need for improved environmental technologies, EPA is committed to maximizing the benefits of the technology program.

Senator BAUCUS. Thank you, Senator.

I'd like to probe a little bit the degree to which current regulations tend to impede or stifle environmental technology development. I mean, some businessmen tell us that, that EPA is too tightly bound, not flexible enough, too much red tape, too much bureaucracy. They say companies have a better way of doing it that just can't be done in dealing with EPA. Is that a problem, in your judgment, either of you?

Mr. GIBBONS. I think it could be a problem. I have to depend here on a vignette. I recall one experience some years back in which a small company had devised a new way of using laser back-scattering methods to detect the size and density of particles in grain silos. It was apparently technically far better and more accurate and less expensive than the then-approved EPA methods for doing this analysis. This company was never able to market that product because it couldn't get timely an EPA approval as an alternate way of doing that monitoring.

So we have to be careful in our regulations about over prescribing the technologies and de facto, therefore, constraining the opportunity for new technologies to enter that market.

Senator BAUCUS. Title IV of the bill is designed to try to get at that problem, to enhance the development of new technologies, and a statute alone is not going to make any difference. It really depends upon the personnel and the drive, if you will, of the people at the agency to make it happen.

Mr. GIBBONS. But it can be important because it sets a tone that, it seems to me, could be very helpful.

Senator BAUCUS. Right. That's exactly right.

Mr. SUSSMAN. Let me speak to that issue. I think you raise a very valid concern. We have had in the past regulatory requirements which are overly prescriptive and perhaps inadvertently have had the effect of chilling the development of new technol-

ogies. Regulations have to give the regulated community very clear targets to shoot at, and they have to define a level of protection which is adequate to safeguard health and the environment, but it's also important that our regulations set performance standards to the maximum extent possible. It's also important that our regulations not freeze technology in its existing state, but create incentives for technology to——

Senator BAUCUS. How do you do that? How do you create those incentives? How do you better assure that technology is not frozen?

Mr. SUSSMAN. Well, I think, first of all, we need to revisit over time the standards that we're setting so that we can reexamine whether new standards are needed to reflect technological advances that have occurred. Second, we need to challenge industry to innovate. We need to write regulations which don't simply reflect or mirror the existing state of the art, but try to encourage improvements and advances which will move the state of the art forward.

Senator BAUCUS. I very much agree with that, but that's a very difficult thing to do. It takes a lot of hard work and a lot of creativity on the part of EPA.

Mr. SUSSMAN. I agree.

Senator BAUCUS. There's nothing easier than for an EPA bureaucrat to say, "No, that's the way we've done it, and that's the way it's going to be" and to protect their rear end and not to be a little bit courageous and stick his neck out a little bit, even though it's a better technology and can do the job better.

Mr. SUSSMAN. Well, I think we're making progress in that area. Under the Superfund Program, we've seen a real increase in the use of innovative technologies at Superfund sites, and we've also seen, I think, some very instructive demonstration projects sponsored by EPA to see whether in fact new remediation technologies do the job in practice. So there are some good things that we're doing, but we can do better, and I think we will.

Mr. GIBBONS. Mr. Chairman, I might add to that one very clear orientation of the administration is to get past the times of constant adversarial relationships between industry and Government and move toward more effective communication. Problems that are being encountered out there must be more readily understood and solutions transferred. We're trying to do this in a variety of ways, and that most assuredly should occur here.

Senator BAUCUS. Yes, I agree with that. In fact, Administrator Browner has demonstrated not only her ability and facility, but her inclination to do a lot of that when she was administrator in Florida.

Mr. Sussman, what about legal liability that encourages excessive conservatism in the agency, that prevents the agency from letting a company go ahead with a new, better, different technology? Are there liability problems? Is the agency worried it's going to get sued by somebody?

Mr. SUSSMAN. I don't think the agency is concerned about liability problems. I think the private sector is concerned that if they use an innovative technology and it fails and it doesn't perform, they may have liability problems.

Senator BAUCUS. But maybe that's their problem. If they want to try the technology and the EPA thinks it will do the job——

Mr. SUSSMAN. Well, I think the way to solve that problem is to do what we're doing in the Superfund Program, which is to provide real-life opportunities to see whether technologies work in practice and, if they do, to make sure that EPA spreads the word, that EPA lets the regulated community know that they think a new technology is proven, it works and in fact is appropriate for widespread use. That, I think, will do a lot to allay the concern of the regulated community about experimenting with new technologies.

I think the concern they have is a very legitimate one. If you use an innovative technology at a Superfund site and it doesn't work, you may have to go back and do the job again, and that's going to cost a lot of money. So I think it's very reasonable for companies to want some assurance going into an expensive clean-up that the technologies they use are technologies that are likely to work, get the job done.

Senator BAUCUS. I'd like to know your reaction to, in your judgment, where EPA should be in helping create and foster new technologies and the degree to which EPA should be kind of a DARPA. At one extreme, EPA could be the sole agency that coordinates the development of environmental technologies, the argument being that, after all, EPA enforces most of our environmental statutes—the Clean Air Act, the Clean Water Act, Superfund, et cetera—so EPA should be not only the stick, but the carrot to help DARPA-like develop these technologies. That's one extreme. The other extreme could be, I guess, nobody's in charge, nobody's in control, no one's coordinating, which may be somewhat the present state of conditions. I don't know.

But my question is, where do you draw the line? To what degree should EPA be involved? Should EPA be in the loop in every case? Because there are a lot of other agencies—DOE, DOD, and so forth. Why should EPA basically control? What should the proper EPA role be in fostering development and providing incentives for new technologies?

Mr. SUSSMAN. EPA obviously has a very pivotal and central role to play, and that's for all the reasons that you mentioned. EPA is the focal point for defining environmental policy. It is also a regulator and, therefore, is in a position to accept or reject new technologies, and EPA, I think, also has a great deal of credibility as an honest broker whose concern is primarily protecting health or the environment. So EPA has a very pivotal role to play, but other agencies have a very important role to play as well.

For example, DOE and DOD collectively have very large clean-up budgets and are managing very complex and challenging clean-up programs at Federal facilities. DOE also has, as we all know, a very large system of laboratories which have an enormous amount of technical expertise. The Department of Commerce——

Senator BAUCUS. What about the National Labs? Should EPA be at all involved with the National Labs?

Mr. SUSSMAN. Well, EPA certainly should work very closely with the National Labs, and I think EPA is already trying to do it. I think what we need here is a partnership where each agency, including EPA, has an opportunity to do what it does best. I think

your bill would encourage that. I also think that the President's environmental technology initiative would encourage that as well.

I would point out that EPA would be the focal point for Government-wide efforts in the President's environmental technology initiative. We certainly think that's a good thing, and we also think it parallels the thrust of your bill.

Senator BAUCUS. What about proprietary secrets, trade secrets, and so forth? Does EPA have experience in dealing with that? Some businesses might be a little worried that EPA might not have experience and know how to appropriately deal with trade secrets when a company comes forward and says, "We've got an idea here".

Mr. SUSSMAN. In fact, EPA is the recipient of an enormous amount of proprietary commercial information right now under the various statutes that it administers. We have numerous statutory provisions on the books which require EPA to safeguard trade secrets, and I think you'll find that EPA has an excellent track record in that area and has done a very good job of protecting the proprietary interests of industry.

Senator BAUCUS. Dr. Gibbons, or either of you, we sometimes hear, "This general approach is faulty because it tends to pick winners and losers." Give me your reaction to that statement.

Mr. GIBBONS. Well, my first reaction is we've been picking winners and losers since the late 1700's as the public and private sectors developed agriculture, aviation, electronics, more recently biotechnology, but these are broad areas. I think the concern is picking winners and losers at the firm level rather than at the broad industrial sector level. It strikes me that apropos to that question you raised, though, Senator, are lessons of history.

If you look back at the old days of the Atomic Energy Commission, that commission got into a problem in that it was the developer, the promoter, and the regulator of a technology. EPA faces a similar concerns as a regulatory agency for environmental issues with strong needs for good science and for their own capabilities in terms of understanding these technologies and helping foster those that work best.

If you look today at EPA's role, as Mr. Sussman points out, in the major clean-up activities of DOE and the Department of Defense, EPA and the States are playing a role not in fostering this work, but in overseeing it and assuring that Federal statutes are being satisfied in that process. EPA is the regulator who is interested in not only clean-up, but in seeing that innovative technologies are developed in that process. But I do feel we have to keep in mind as we move along here that you can get into trouble if you become both the developer and the regulator.

Senator BAUCUS. In this case, what do you think the biggest adverse consequence would be? What would be the biggest problem?

Mr. GIBBONS. I'm not sure that there will be a problem. But you could imagine a problem in which EPA decides two or three technologies really look very promising and, therefore, in its regulatory side of things, begins to favor those simply because they were its favorites in the development side. That's speculative, but it seems to me that's the kind of problem that EPA is going to have to be concerned about.

Senator BAUCUS. I appreciate that.

Well, I want to thank you both very much for your testimony and support of the bill. Do either of you have anything to say that has not yet been touched on that you think should be addressed?

Mr. GIBBONS. I look forward, personally, to finishing reading the bill, Senator, and we do applaud your——

Senator BAUCUS. We look forward to your comments, Dr. Gibbons. I know you'll provide a lot of constructive ideas on how we can refine and improve upon this bill, and we look forward to them.

Mr. GIBBONS. Thank you.

Senator BAUCUS. Thank you very much. Thank you both.

Our next panel is Dr. Darryl Banks, Director of the Program on Technology and the Environment for the World Resources Institute; Mr. Dag Syrrist, Manager of Environmental Operations for Technology Funding in San Mateo, California; Mr. Robin Robinson, Executive Vice President of Clean Sites; Mr. Bruno Brodfeld, Vice President and Manager of Advanced Technologies, Stone & Webster Engineering in Boston; and Mr. William Sonntag, Director of Government Relations, National Association of Metal Finishers.

Dr. Banks, you're in the middle there, and you're at the top of the list. You might as well begin.

STATEMENT OF R. DARRYL BANKS, DIRECTOR, PROGRAM ON TECHNOLOGY AND THE ENVIRONMENT, WORLD RESOURCES INSTITUTE

Mr. BANKS. Thank you very much, Mr. Chairman, and good morning. I'd like to thank you for the opportunity to testify this morning on our views and the issues underlying S. 978, the National Environmental Technology Act of 1993. I would like to ask that my complete testimony be submitted for the record.

Senator BAUCUS. Without objection, all of your prepared statements will appear in the record.

Mr. BANKS. I will summarize the key points in my oral presentation.

At the outset, I would like to commend the Chairman and the committee for actively addressing and engaging this very important set of issues. From our work at the World Resources Institute, we see a growing interest in the realization that environmental quality is consistent and indeed conducive to a healthy climate for economic growth. The new world markets for environmentally superior or environmentally advantaged technologies is large and is growing rapidly. The insight that environmental performance can strengthen competitiveness is permeating industrial policies of our major trading partners, and it has quietly taken hold among some of the best American corporations also.

However, we see the United States has been slow in terms of national policy to grasp this connection and to revamp its environmental technology policies according. Reorienting public research and development priorities and funding is crucial if our Nation is to develop new technologies that solve environmental problems and pave the way for economic growth and competitiveness. Political

leaders the world over will be called upon to guide and speed this technological transformation in the coming decades.

At World Resources, we have undertaken an array of studies aimed at identifying technologies and policies that are critical to environmental progress and economic competitiveness. We have not been alone in this effort. Many other institutions, including the National Academy of Sciences, the Office of Technology Assessment, and the Carnegie Commission, for example, have examined these issues. But I think it is noteworthy to realize and to point out the convergence of our findings and observations with those of the legislation before us today, S. 978.

First of all, with the global population likely to double by the middle of the next century and an increasing worldwide demand for economic growth, only a massive transformation of today's products, processes, and infrastructure through rapid and extensive technological change can prevent environmental and economic disaster.

Second, we see national science and technology policy in this country not reflecting the changing priorities that have arisen with the end of the Cold War and the new salience of environmental issues both domestically and internationally. Priorities in the allocation of national R&D spending remain sharply skewed away from environmental issues and from protection against environmental threats.

Third, in the United States we see environmental technology research and development suffering from a structural fragmentation that has made long-term planning and coordination extremely difficult to achieve. For example, Federal environmental R&D funding is spread across at least eight different agencies and programs, making it quite difficult to impose a coherent overarching policy.

Fourth, environmental technology policy making in the United States does not have a central focal point, coordination, or central coordinating mechanism.

Fifth, although private firms in this country are active in marketing environmental technologies, a public role, we feel, is justified to underwrite the more basic generic technical knowledge base needed to solve the next generation of environmental problems and necessary to keep U.S. firms competitive.

It's interesting to note that although the United States has led historically in the development of environmental standards and technologies to combat environmental problems, the lead in many areas has slipped out of American hands, and other nations are forging ahead faster with the development of environmental technology policies to craft tomorrow's solutions.

In particular and with regard to the underlying issues of S. 978, there are, from our work and judgment, three basic tasks that must be accomplished if the U.S. is to develop an environmental technology policy. One is to move environmental factors from the periphery, according them central importance as public support for technology development and as this support is apportioned. Second is to reform environmental regulation to make these regulations an engine of technological change instead of a deterrent. Third is to expand intelligently and appropriately the use of economic incentives to catalyze technology innovation. Accomplishing these broad

tasks will take time, will require new legislation, revision of current statutes. It will require new public and private sector partnerships, and it will require research and development funding which must be strengthened and reoriented.

Key elements of a new environmental technology policy, we feel, are rather clear. To address these issues, our work suggests the following points, and I will just summarize very briefly. First, again, we indicate the need for the creation of a civilian technology agency to support research and development of critical technologies, especially making environmentally critical technology one of its primary focal points.

Second, we endorse the need with regard to a national strategy for environmental technology. We feel this is a vital tool for long-term planning and for coordination of policy and budget.

Third, in the short term, while we are beginning to look at reorienting our policies and developing a strategy, we think that the most important civilian R&D programs—for example, the Advanced Technology Program, the National Manufacturing Incentives Program—should refocus their budget priorities on environmental technologies.

Fourthly, a key action that we feel could accelerate the diffusion or use of environmental technologies would be to establish and implement an environmental technology export assistance initiative. EPA, for example, could play a key role along with the Commerce Department in developing a new Federal initiative in this direction.

Fifth, there should be an active initiative, we feel, to make environmental and commercial concerns a major thrust of the missions of the National Laboratories.

Sixth, we feel that economic and, as I mentioned before, fiscal incentives can be very key to stimulating investment in environmentally critical technologies.

Finally, we feel that the regulatory agencies, in particular the EPA, should be directed to propose changes in environmental regulations that would encourage and stimulate technology. Many of our environmental laws, for example, favor old technologies over new. Relying on end-of-pipe pollution controls has tended to entrench and solidify existing technologies at the expense of long-term innovation.

In broad outlines, in conclusion, these policies would, we think, support a development and diffusion of environmentally critical technologies, but establish a focal point within the Government to coordinate our policy, would lead to the development of a national strategy, and would encourage and hopefully embody new patterns of public-private sector collaboration.

I would like to close by again thanking you for the opportunity to testify and would look forward to sharing our work as this legislation is developed.

Senator BAUCUS. Thank you very much, Dr. Banks.

Mr. Syrrist?

STATEMENT OF DAG SYRRIST, MANAGER, ENVIRONMENTAL OPERATIONS, TECHNOLOGY FUNDING, SAN MATEO, CALIFORNIA

Mr. SYRRIST. Thank you very much for this opportunity to share the view of the investor. I'm with Technology Funding. We're a venture capital firm in California. We manage about $300 million. We have 190 portfolio companies that we've invested in that, combined, generate about $1 billion worth of sales per year and employ several thousand people. We have invested in this area for a long time. We also host an annual conference that deals with venture capital investing in environmental technologies, are actively involved in the regulatory agencies both at NACEPT and TIE committees, Western Governors Association, National Labs, and so forth. After investing for a number of years here, what we've found is a system that fears innovation and repels capital.

Senator BAUCUS. I'm sorry?

Mr. SYRRIST. We have found a system that fears innovation and repels capital.

Senator BAUCUS. Thank you.

Mr. SYRRIST. No one in this process, from a venture capital investing standpoint, is making any money. If we don't make any money, we don't make the investments. The barriers to making the rates of return that we seek and to commercialize environmental technologies that we've found are as follows:

First of all, information. When we go to industry and ask what their most compelling environmental technology needs are, they don't want to talk to us. Nobody wants to share their most compelling need for fear of that disclosure going to the public, including regulatory agencies.

Second, small firms need to show that their technology can provide the compliance that industries purchase. If I cannot show that my technology works, I cannot prove that I can provide compliance, and, therefore, I have no market. In other words, I need testing and demonstration facilities. Private industry is unwilling to test new technologies for fear that it will result in non-compliance and, therefore, they'll have to shut down their operations. The risk of failure, therefore, is preventing that from occurring.

Third, the permitting process. It is not that it is terribly long or that costly; it is that it's unknown. When we don't know how long it will take to permit something, we cannot estimate how much money we need to invest in order to get something to market. Also, what is fundamentally different in the environmental technology sector from any other technology sector in the country is that in the environmental area we permit sites, not technologies.

The Food and Drug Administration, for instance, will permit a drug that you can later commercialize and sell to the entire country—one single large national market. That is the deal that was made in order to get private industry to spend the $130 million it takes to bring a new drug to market. In the environmental sector, as long as you have site-specific permitting, it is impossible for me, as a developer, to get large enough markets to warrant the capital infusion needed to develop new solutions.

As a result, industry develops their own technical solution to their own site-specific compliance problems, and the country, as a

whole, ends up spending a lot of money on compliance that we should be able to cover by having mass production of technologies that benefit us all.

Fourthly, reference sites is a major barrier. Small technology companies need reference sites from large, blue-chip industrial companies to say, "The AT&Ts or the General Motors of this world purchased my box, and now the rest of the market can buy that." Nobody wants to be a reference site for an environmental problem. It would be akin to me asking somebody if they know a good drug rehabilitation clinic. Nobody's going to suggest that I use the one down the street that's wonderful.

Last, industry wants to buy compliance from established vendors. They're looking to buy compliance as the product. It is not the technology per se. Small companies cannot demonstrate that they are able to provide compliance to large manufacturing facilities. You have a chemical processing plant that, in one case that we came across, generates $100,000 of profits per hour for the manufacturer. They're not going to let a little start-up with a wonderful new box try that technology on their site and, if it fails, they're out of compliance.

Because of these barriers, what has happened is that there is no capital commercialization. There's a lot of capital for R&D and development both in the industrial sector and in Government because they have to be in compliance, and because there's no vendor of established compliance providing technology, they develop it in-house, in parallel, and everybody is to meet the same goal. As soon as you move into the commercialization stage, there is no capital. Venture capitalists like myself, corporate investors, and so forth don't invest in technology areas where they have had limited or marginal returns on investment. That capital has gone away.

In terms of needs, what we need to provide the capital to this industry—to give you an example, by the way, venture capital manages about $40 billion; in 1991 we made five new environmental technology investments combined, the whole industry. We need to allow for error. If you're going to improve technology with trial and error, there has to be room for error. We need to take away the liability from the testing and demonstration process, whether that's in the private facility or in the Federal facility. We need to have performer verification so that I can go to a company and say, "This is what my box does" and that it comes from a credible source. I think Government could also use its purchasing powers to provide that initial market demand. I don't want grants for my technology, I want purchase orders. I want revenue.

I would suggest we look at the FDA model. The FDA model has created an extremely successful commercial business in the U.S. that incidentally, once established and approved, is also a model that other countries use, and companies that go through the FDA have those markets for free, if you will.

I see I have no time left here. If we do not allow private capital to have a viable way to make a reasonable profit from commercializing environmental technology, we will continue to lose this industry. Over the last 10 years, U.S. ownership of environmental remediation technologies went from 64 percent to 31 percent because there are no domestic sources of capital to purchase. In air pollu-

tion control equipment, it's worse. It is now 70 percent owned by foreign countries.

We need to find a way for the private sector to be able to provide cost-efficient technologies that we can all benefit from, to create the jobs, improve competitiveness in exports. In terms of exports, if I could just add, we need to make a commercial successful market domestically first. Small firms do not have the wherewithal to go abroad and sell to other countries as an initial market.

Thank you very much.

Senator BAUCUS. That was very interesting. Thank you.

Mr. Robinson?

STATEMENT OF ROBIN J. ROBINSON, EXECUTIVE VICE PRESIDENT, CLEAN SITES

Mr. ROBINSON. Thank you, Mr. Chairman. My name is Robin Robinson, and I'm the Executive Vice President of Clean Sites. We appreciate the opportunity to testify today on the need to promote innovative clean-up technology.

Clean Sites was formed in 1984 by a group of industry and environmental leaders and former senior Government officials as a non-profit organization dedicated to solving the Nation's hazardous waste problems. With a board of directors comprised of representatives of business, academia, public service, and environmental interests, Clean Sites' efforts to improve and accelerate the clean-up process are directed toward conducting policy analysis, providing technical project management services at sites, and mediating and allocating clean-up costs among potentially responsible parties.

In this testimony, I'll describe our involvement in innovative technology initiatives and why it's important to encourage development of better clean-up tools and systems. I'll then briefly outline some of the barriers to getting new technology tested and used.

Clean Sites is currently working with EPA's Technology Innovation Office to develop and facilitate public-private partnerships to evaluate innovative technologies for hazardous waste treatment at Federal facilities. These partnerships focus on jointly funded technology evaluations at selected areas within Federal facilities. The partnerships are based on the concept of cost and information sharing between Government and industry. The objective of the partnership is to obtain cost and performance data which are representative of real-time, real-world, full-scale conditions.

The private partners benefit directly by analyzing the data collected and using the results to understand how these technologies may work at their own sites. They gain this experience without the risk of double jeopardy—that is, using innovative technologies at their own sites where, if the new technology does not work, the responsible parties would have to repeat the clean-up using conventional technologies.

The Federal facility benefits from the partnership by the additional information gained and by validating the technologies for use at other Federal facilities. The first Federal facility to participate in the partnership is McClellan Air Force Base in California, who is evaluating several innovative in situ groundwater treatment technologies there. These evaluations will collect the process, oper-

ation, cost, and performance data necessary to modify and apply promising technologies at other hazardous waste sites. This information will be in the public domain. EPA will be responsible for disseminating the information and facilitating the use of these technologies at other sites.

Let me turn now to the importance of improving technologies for hazardous waste clean-ups. Clearly, remediation costs using existing technologies are very high. Development and implementation of improved technologies offer PRPs, municipalities, and Federal agencies the possibility to resolve their liabilities in a more cost effective manner. The money saved by using innovative technologies could be used to reinvest in industry, create new jobs, offer job training programs, expand small businesses, allow municipalities to provide needed services—in short, to better serve our Nation's needs.

In addition, because clean-up costs are so high, both industry and Government responsible parties often tend to delay clean-up rather than proceed with remedial action. We, as a nation, need to develop improved solutions to hazardous waste remediation in order to expedite clean-ups.

However, there are a number of problems in developing improved technologies for Superfund clean-ups. Here are some of the major barriers we see to trying new remediation technologies at hazardous waste sites.

This first set of barriers falls into the general category of market incentives, or disincentives. It has been suggested that we should just let traditional market forces solve the problem of creating new and improved technology. That's a sound approach, and it may ultimately work; however, right now there are several differences between traditional markets and the Superfund market which have created barriers to bringing in new ideas.

The first difference is that market types are not uniform. Mr. Syrrist has referred to that. We have to work on a site-by-site basis at hazardous waste sites.

The second barrier is that the technology selection is separated from technology development. In the traditional marketplace, the decision maker has something at stake, usually a high financial stake. If successful, the up-front investment of time and money will be their payoff. In the Superfund Program, by contrast, the ultimate technology selectors, the decision makers, are many different EPA employees who have little or no financial stake in the outcome. Because innovative technologies have often not been proven under field conditions, because EPA is under pressure to achieve clean-ups quickly, and because EPA is reluctant to participate in controversy, the agency is often likely to select an established technology rather than an innovative one.

The third market barrier is that penalties often appear to outweigh rewards for risk taking. That has been referred to previously, and I will not go into that any further. It is the impression of many responsible parties, however.

The last barrier is built on the others. In situations of uncertainty, investors and inventors are reluctant to move ahead, and, again, Mr. Syrrist has referred effectively to that.

If I have a minute more, I would like to comment on a couple of other points.

Senator BAUCUS. One minute.

Mr. ROBINSON. First, the lack of a national research strategy. Currently, there is not an overriding national research strategy. An interdepartmental panel such as this committee is considering could develop a Government-wide environmental technology strategy that would encourage technology development by identifying critical needs and recommending actions to spur development and spreading of technology. There is basically no road map right now for new technology development.

The last point I should make is that the McClellan Project we are carrying out provides a direction that we can move on a small scale. If that were expanded into a broader program, that could be beneficial.

Thank you very much.

Senator BAUCUS. Thanks, Mr. Robinson, very much.

Mr. Brodfeld?

STATEMENT OF BRUNO BRODFELD, VICE PRESIDENT AND MANAGER OF ADVANCED TECHNOLOGIES, STONE & WEBSTER ENGINEERING CORPORATION, BOSTON, MASSACHUSETTS

Mr. BRODFELD. Mr. Chairman, I appreciate the opportunity to present testimony at this hearing which considers the proposed National Environmental Technology Act of 1993, a bill that addresses technology issues of great importance to the country. I would like briefly to present to you the perspective of our company and why we support this bill. I will now make only a few key points which summarize my written testimony.

Stone & Webster Engineering Corporation is a major engineer-constructor with broad experience in engineering, design, and construction of projects for the Government and the private sector. One of the key areas of activity of our company is environmental work, including, among others, site studies, feasibility investigations, pollution control, and hazardous waste remediation. A common thread of many of these activities is the application of environmental technologies, including advanced technologies.

Mr. Chairman, in the last two years our company has made a determined effort to contribute to a national approach in which Government and industry would cooperate as users of technology, particularly in hazardous waste remediation. I emphasize the term "users of technology," because we feel it is precisely in the area of applying clean-up technologies that the common interests of Government and industry are the most obvious.

For example, we understand that several major companies are spending on the order of $50 million to $100 million annually for site clean-up work, and, therefore, they have as much interest as the Government in the development, demonstration, and application of innovative technologies that would be more cost effective than the existing ones.

A good example of a joint program was just mentioned by Mr. Robinson, the participation of seven companies along with State and Federal agencies in the technology demonstration program at

McClellan A.F.B. Our company is assisting Clean Sites in the technical facilitation of that program, so we're very familiar with all its aspects. However, I'd like to state that at this time there is no institutional mechanism in the country that would promote such partnerships. We're, therefore, very pleased to see that the proposed legislation would create a framework for such joint efforts.

I would like now to address some of the key areas where joint efforts between Government and the private sector would be very beneficial. In our view, first and foremost, joint technology demonstration programs would be an important area of cooperation. I am basing this statement on an analysis we made of the barriers that slow down the transfer of innovative technologies to potential users in industry. This goes to the heart of one of the questions you asked of the previous panel.

In our experience and based on meetings and discussions with a number of technology users, technology developers, and Federal and State regulators, we found that a root cause for the slow and somewhat disappointing penetration of innovative technologies is a lack of confidence and uncertainty on the part of potential users and regulators alike regarding how reliable is the performance and cost information derived from technology demonstrations. This uncertainty triggers concern about added risks and liabilities and, as a practical matter, often causes outright resistance to the use of innovative technologies.

Mr. Chairman, this leads to the logical conclusion that the only way this difficulty can be overcome is by improving the way technologies are being demonstrated so that the information that is derived from them becomes more reliable. Based on our experience and on all the discussions that we've had with the stakeholders, we believe the demonstrations should be preferably undertaken at Federal sites—for example, Department of Energy or Department of Defense sites—with the active participation of potential technology users from industry—this is a key recommendation we make—the active participation of potential technology users from industry, who would provide input and comments and would review test results. Such participation would enhance the credibility of the results and could significantly accelerate technology transfer.

We also believe that the participation of regulators and other stakeholders in such technology demonstration programs would be very beneficial and would facilitate the acceptance of new technologies.

In our view, the enhanced credibility of technology performance and cost information derived from such broad-based participation would also contribute to stimulating investment by private sector capital, which is a problem that was mentioned by the previous witness.

Another area where joint efforts would be very productive, in our view, is that of technology evaluations at sites where new technologies have already been applied. At this time, there is no systematic record in our country of how the various technologies have actually performed in the field and what lessons can be learned from their application. The absence of such a systematic record has a negative impact on the decision making process of site managers

and tends to favor established technologies to the detriment of innovative technologies.

Mr. Chairman, we are very encouraged by the fact that the proposed legislation establishes mechanisms that can potentially correct these deficiencies. In particular, Title III of the bill indicates a funding mechanism for joint programs, and Title IV establishes programs for technology evaluation. We hope that in its implementation guidelines, this legislation will focus on these critical issues.

In conclusion, I would like to express our support for this bill and our confidence that the proposed legislation will contribute significantly to an accelerated diffusion of environmental technology. I would also like to mention that industry could constructively contribute to the development of the anticipated guidelines for implementation of this legislation, which, as I mentioned before, is a critical step that we're looking forward to.

Mr. Chairman, I thank you again for the opportunity to present this testimony.

Senator BAUCUS. Thank you very much, Mr. Brodfeld.

Our final witness on this panel is Mr. William Sonntag.

STATEMENT OF WILLIAM A. SONNTAG, DIRECTOR OF GOVERNMENT RELATIONS, NATIONAL ASSOCIATION OF METAL FINISHERS

Mr. SONNTAG. Mr. Chairman, let me express my appreciation on behalf of the over 800 members of the National Association of Metal Finishers for this opportunity to provide testimony. First, the Association commends the sponsors and the committee. This legislation contains numerous provisions which take into account the needs of small businesses as technology developers as well as technology users. Also, to the extent which it applies technology to environmental problems and seeks to establish a new paradigm, as Senator Moynihan mentioned earlier, that certainly is a positive direction for policy.

NAMF, again, brings the perspective of regulated small business technology users to this bill. We participate in the development of environmental technologies, and we in fact are the folks who make the market for the commercialization of environmental technologies.

It's important to keep in mind that in addition to environmental remediation, the largest immediate demand or market for innovative technologies is going to be found in our existing manufacturing base. This market demand for the technologies is shaped both by environmental regulations and our members' interest in finding improved, cost-effective solutions to remaining environmental risks. Although totally new technologies will over time provide new jobs and economic activity, an environmental strategy that assists current manufacturing sectors will occur sooner. It will provide jobs sooner and provide some benefits in imparting efficiencies and competitiveness to our existing industrial processes.

As a result of the ever-increasing complexity and the cumulative cost of environmental requirements, our industry, NAMF, has taken responsibility for fostering technology where we can. We've cooperated with EPA in a variety of forums investigating impedi-

ments to technology development and deployment. We have initiated our own national technology assessment of environmental technology needs within our industry sector through cooperation with the National Center for Manufacturing Sciences, and we have participated and continue to participate as a panel member with the Office of Technology Assessment on their study of environmental regulation and international competitiveness.

We would strongly suggest that in order to encourage a market for environmental technologies, the legislation's national environmental technology panel give equal or greater weight to making recommendations in policy about regulatory reform and progressive environmental policies, which would include, as mentioned before, cooperative environmental performance standards development, pollution prevention, flexibility in standards, and incentives for innovation.

Complexity in Government environmental regulations is not the only place where it resides. Frankly, from my perspective in a small business trade association, there's a great deal of complexity, sometimes bewilderment, in regard to the current technical assistance and technology assistance programs that exist. We would support the provisions of the legislation that try and coordinate those policies and those programs across the Government.

We have one suggestion, however—that this coordination should result in reduction of duplication and increased efficiency in the national programs. We think that the panel should investigate cost savings from those reductions in duplication. Those savings might in fact offset the increased funds that are called for in the revolving fund in the legislation.

Finally, we also certainly approve of the provisions in the bill regarding the coordination with the National Institute of Standards and Technology. We've just begun to cooperate with NIST on programs. We truly feel that kind of technical assistance and outreach is going to be the important part of disseminating technologies to the users.

Just a couple of things that we have some concern about in talking to my supplier folks in the industry over the last couple of days—the clearinghouse part of the cooperative agreements in the legislation in fact is scary for the potential users of that program. They're concerned about the distribution of proprietary information there. Those provisions would have to be considerably clarified for them to want to come in with their funding. On the other hand, I think that the small start-up firms are going to be anxious to utilize the kind of programs that might result from this legislation.

Finally, on the verification programs, it may have two effects. One, as Mr. Syrrist mentioned, it could create a national market, certainty for regulators, certainty for technology users. On the other hand, we're very concerned that the verification be used to impart flexibility in standards, not constantly change the performance standards that industry has to meet. We put in the technology, and then the standards change. It's a considerable problem which results in really the lost expenditures from the fact that we have spent the money on technology.

So, again, I appreciate the opportunity to comment. We've submitted written comments for you as well. Thank you.

Senator BAUCUS. Thank you very much, Mr. Sonntag.

Let me go back to you, Dr. Banks. You said earlier something to the effect that only massive technological development in this country, maybe world, can avoid pending disaster 20 or 30 years from now, I assume. What do you mean by that?

Mr. BANKS. That may be a bit dramatic, but the point that was referring to out of the testimony is the sense that with the potential doubling of population within the next 50 years and looking at an economic base globally that would be necessary just to sustain that, without changes in the way that we make things, produce things, when we support that population, even to date we can realize current circumstances where we're incurring enormous natural resource degradation. The pollution burden, certainly, on the planet is increasing. The technological transformations that we're talking about are the use of our science and technology assets to enable us to try to solve the problems that are going to be looming and to reduce the associated environmental and ecological burdens concomitant with that level of development.

Senator BAUCUS. One commentator said if the population doubles, say, by the year 2000 and productivity increases by the same amount, there would be a five-fold increase in the amount of goods and services produced by this world in that time, and the argument, therefore, is that we have to spend much more time than we have in the past on developing environmental technologies that deal with the consequences of all of that. Is that square with your view?

Mr. BANKS. That's very much in line. One of the factors in our work that sort of buttress that, again, is looking at a five-fold increase.

I think the other point I'd like to make is that when we're talking about environmental technologies, we're looking at a much broader sort of notion than just pollution control devices and end-of-pipe circumstances and remedial technologies. This gets to the heart of process change, design——

Senator BAUCUS. I very much agree with that. You said the U.S. lead has slipped in many areas. Mr. Syrrist explained that due to lack of capital, the commercialization has caused some of our technology production to slip. Where, in your view, has the U.S. lead slipped?

Mr. BANKS. Well, two examples sort of come to mind. One is, in a sense, in terms of development of alternative fuels—hydrogen technology, for example. Right now it seems by several indicators that the Germans have moved ahead and are recognized widely as at the forefront of developing that potentially non-polluting fuel for a variety of future uses.

In the realm, for example, of control technologies, the device is selective catalytic reduction, which is very essential to reduce nitrogen oxide from stationary air pollution sources. Technology that initially, I think, was an innovation that occurred on these shores, markets, for a variety of reasons, were not found, and what we see is that indeed one of the major leaders in sort of developing and commercializing that technology now exists abroad, in Japan.

In some of the other areas, for example, some of our work in particular has shown that there is increasing attention being paid

toward bringing together broadly based disciplines to solve major environmental problems. I look at some work, again, that's going on in Japan with regard to carbon fixation, for example. Now, many of us have looked at that and said, "Well, that's a very interesting scheme, but when you look at whether that violates the principles of physics and what have you, will it ever work, you come up with doubts."

Senator BAUCUS. What is carbon fixation?

Mr. BANKS. Well, this particular notion is a large effort that is being funded publicly in Japan, with private sector cooperation, to devise a way to remove carbon dioxide from stationary combustion sources and to change that CO2 catalytically to useful products. Thus, it would allow you, for example, to continue to have a carbon-based fuel source without moving to conservation, et cetera, et cetera, sort of closing the loop.

One of the things that's intriguing to me about that effort is not necessarily the end result, but some of the pieces that go into making it work—the technologies that will allow one to separate these gases, the technologies that will allow the transformation, for example, of the carbon dioxide to other materials. There's substantial work going into catalysis processes that would work at low temperatures and be highly effective and make that overall project work.

What that tells me is that even if the end result is marginally successful, the Japanese perhaps will have quite a few very interesting innovations that will be beneficial generically to industries, a catalytic framework of being able to have separation technologies that will certainly affect a wide range of industries from its efficiency standpoint and less-polluting standpoint.

Senator BAUCUS. Let me ask anyone else to comment on Dr. Banks' statements thus far.

Mr. SYRRIST. If I could, I think we keep referring to the Europeans or the Asian countries in particular as being able to commercialize and then export environmental technologies. I think it's important to distinguish that what they do is considered a conflict of interest in this country. They determine up front what their environmental needs are and then determine what is the cheapest solution to fill that hole.

Earlier we heard reference to hospital waste, for instance, not finding a home and, therefore, maybe having to shut hospitals. If you're going to sell technologies to treat hospital waste in the United States, you have to get permits in market areas that are the size of zip codes. Those are not large enough markets in order to raise the capital to develop better technologies to do cheaper, and as a result the country, as a whole, ends up spending a lot of money on treating hospital waste.

Senator BAUCUS. I'm sorry. How do the European nations do it that otherwise would be a source of conflict?

Mr. SYRRIST. They have much larger areas that have similar standards. So, for instance, I have an asphalt recycling company, and my portfolio recycles 100 percent of asphalt cheaper and better than virgin and avoids all the other pollution issues. In this country, I have to get a different air permit by approximately every four and a half miles of roadway that I lay, and then the Dutch

come in and they offer me 20 cents on the dollar on my investment. I have the choice between either shutting the company down or selling it.

Senator BAUCUS. Your earlier point that environmental technology is site-specific, it's not——

Mr. SYRRIST. It's very difficult, therefore, to create the sort of markets that will justify investments.

Now, the earlier remarks about we'll double population and so on, that assumes that we will continue to do things the way we do now, and I would suggest that if the Federal Government wants to find out where the best innovative technology is, look at who was number one last year on the toxic release inventory list. They're spending hundreds of millions of dollars to get out of the number one spot. Find a way to take those technologies and benefit the rest of us. But the problem is that most industrial companies are not in the business of commercializing those technologies they've developed in-house but yet work perfectly well.

Senator BAUCUS. How would you encourage the rest of us that utilize that list?

Mr. SYRRIST. As an example, General Motors has spent $13.5 million developing a wastewater treatment technology that they won't even give away because they're afraid that if somebody else uses it and misapplies it, then they are liable for whatever results from that. We have to find a way to get around the liability issues of people who develop environmental technologies. I will never take one of my portfolio companies to a Federal facility and test it if, if it should fail, I am then partly liable for that entire clean-up.

It was mentioned earlier Y-12 down at Oak Ridge. These folks make nuclear weapons for a living, from what I understand, yet they're afraid of liability if I bring two bugs there in a shoe box to try to eat a gallon of dirt. You know, this is totally out of relationship with each other.

Senator BAUCUS. Well, back to the General Motors example, how would you begin to try to solve that one?

Mr. SYRRIST. Well, it seems to me that Congress, from what I understand, has the ability to limit the liability that original developers have if somebody else uses it or, in this case, would misuse it. I mean, everybody accepts liability for gross mishandling or doing something inherently wrong, but we have to allow for failure. We have to allow for technologies not to work. If General Motors has a technology they've developed in-house because they couldn't find a supplier, then people have to be able to license that technology and use it, and if they fail or misuse it, GM should not be liable for that.

Senator BAUCUS. You're basically saying, unlike the reactions of others here, that it's liability which is maybe the biggest impediment.

Mr. SYRRIST. It adds to the total cost, and as a result we are now spending money in this area. This industry is twice as big as the personal computer business, and it doesn't even have an SIC code. This is an enormous problem for the companies trying to make a living and be competitive.

Senator BAUCUS. Why don't we have an SIC code? Why has that not occurred yet?

Mr. SYRRIST. I don't know. I think it's primarily, again, because most expenditures are internally in companies and are done on a site-specific basis, and so you can't even, for instance, make corporate sales to companies that have similar needs in different districts.

Senator BAUCUS. That was earlier the case, I know, in the nuclear industry. Every nuclear reactor was specifically designed for that particular location. That's one reason the industry did not do well in this country, because there's no off-the-shelf technology that could be applied somewhat universally across the country, as was the case in France and many other countries. I understand the technology now is much more universal, but for a long time it was not, and I know that caused a lot of problems.

Mr. SYRRIST. We certainly encourage if this bill can create consensus, if there's some way that EPA or other agencies can take leadership and create that consensus as to what the country can do.

Senator BAUCUS. I'd like others to react to this, particularly the liability problem.

Mr. ROBINSON. Mr. Chairman, I agree with Mr. Syrrist. In the Superfund arena, certainly, the liability issue——

Senator BAUCUS. Well, that's pretty clear, Superfund.

Mr. ROBINSON.—is very difficult.

Senator BAUCUS. That's right.

Mr. ROBINSON. One of the problems we faced in putting together the public-private partnership at McClellan Air Force Base was just that. The private companies who were going to participate certainly did not want to assume any liability at all for what was going on at that air force base, where the clean-up will cost hundreds of millions of dollars total. So that is a problem that certainly needs to be addressed when Superfund is reauthorized.

The other comment I can make—our company focuses on Superfund problems, and my comment here is about Superfund and your question about have we lost the technological lead. I don't see that we have lost the technological lead in Superfund, rather that we just haven't made much progress in improving the technology. The current technologies that we use in the vast majority of cases are to burn the waste or bury it, and that's technology that was developed by the Romans, I guess, or before. We haven't been able to make much progress to get beyond that, but I think the technology resides currently in the United States rather than overseas.

Senator BAUCUS. Is part of the problem not only the liability standards in Superfund, but also the clean-up standards? Isn't that part of the problem, too?

Mr. ROBINSON. Yes, clean-up standards vary from region to region in the United States, from State to State in many cases.

Senator BAUCUS. That's Mr. Syrrist's point.

Mr. ROBINSON. Yes. Moving in the direction of establishing national criteria rather than State-by-State criteria would certainly be a move in the right direction.

Senator BAUCUS. But how are we going to get at this problem? There's a provision in the bill—that is, the verification program—that's attempting to begin to get at this. Do you think that's a proper approach, or do you have a better idea?

Mr. BANKS. Well, I think the verification program, at least the testing provision for testing facilities, is really aimed at a very good direction, is going toward provisions for firms and vendors to build at full scale, to test these things out, perform its limits, sort of get some sense of how well they work and when they not work and when they will fail.

I think we can get at some of the other issues, though, by beginning to tackle that very difficult wicket that you raised with the other panel, which is the whole notion of how do we begin to look at our regulatory structure, procedures, reform efforts, performance-based standards. Some of these things are going to be very difficult to tackle, but I think we need to look at them now rather than later. There are already existing waiver provisions in some of the ongoing statutes with regard to innovative techniques, innovative developments, and in many cases these just have not been consistently initialized. I think we can look at making, certainly, some gains along those areas.

But in particular, it seems to me, those are certainly two large areas that we can look at in terms of moving ahead. I'm not sure that the notion that standards are so different locality by locality is that much of a deterrent. I mean, it may seem that way for, certainly, American firms. Evidence is slightly different abroad. I mean, you look at regulatory structures in particular, for example, or Japanese work that we've looked at. In Japan there are certainly national standards, a baseline set of standards, but they vary widely in terms of location and municipality. Many of the localities and municipalities are much more stringent than the national floor, and one finds industries that are perfectly operating quite well and at the edge of innovation within those localities.

So I'm not sure that we need to go toward some length of imposing conditions that would in essence put an extreme consistency across the country.

Senator BAUCUS. I doubt that they have restricted liability.

Mr. BANKS. That's true. I mean, that is certainly not a major facet of that particular sort of structure, nor is it the terribly litigious sort of circumstances that we find ourselves in.

Mr. BRODFELD. Mr. Chairman, if you look at the issue of liability, there's one aspect of this liability which we believe can be addressed. That aspect is the risk that a user of a technology is exposed to if he uses a new technology and it fails. Failure doesn't have to mean total failure, it may just mean inadequate performance. Today what happens is that he has to redo the whole thing and use another technology and, therefore, spend more money. This is the one thing that scares everybody and that's a key deterrent against applying innovative remediation technologies.

How can this be reconciled? We know from our experience in all other technologies that a demonstration process can sometimes be lengthy. When you demonstrate a technology, it fails sometimes, you have to improve it, and you have to make corrections before you get to the final product. The answer we would like to give to this dilemma is that a way can be found, in our view, to decouple the notion of technology demonstration from the notion of applying the technology in a schedule—constrained remediation program.

In other words, we believe that serious consideration should be given to designating a number of sites in the country, where technologies will be demonstrated without the pressure of a schedule, where the regulators would agree that this is a designated demonstration site, and there are going to be a number of those sites where you demonstrate a technology until it reaches its full potential. It's a place where you really develop the technology, which is then a source of credible information that people will look to with confidence and will use in evaluating the potential application of the technology at their own sites.

Now, we cannot do this at all sites, because that would mean that everybody's exempt at all sites. But you can do that for a limited number of designated sites, and that, of course, will have to be done carefully in conjunction with EPA to determine where the public health would not be jeopardized by a possible failure, and where there is a certain degree of flexibility.

My main point is that in our experience with all technologies other than remdiation technologies, there is no precedent of a technology where the mission is you have to demonstrate it and you have to be successful in a specified time. There is no precedent to this in any other area of technology.

Senator BAUCUS. We've been talking a lot about clean-up, end-of-the-pipe technologies. What about preventive technology as far as reduction and so forth?

Mr. BRODFELD. That's part of the answer to your original question about what happens with the population doubling and so on and so forth.

Senator BAUCUS. Right.

Mr. BRODFELD. There's no need to just remediate more sites. There is, rather,a need to change certain production processes so as not to produce this pollution, and this is a trend that is now in place. What this bill does is that it allows smaller companies to benefit from this trend. The larger companies are doing it now, but they often keep these things proprietary.

Senator BAUCUS. You're right.

Mr. BRODFELD. But this legislation will help smaller companies that cannot afford to do it by themselves, that require a pooling of resources, and may require Government assistance in defining the problem, disseminating the information, and sponsoring specific programs.

Mr. SONNTAG. Mr. Chairman, if I may comment on that, I think, again, the illustration I used, the technology survey that we've undertaken in our industry, is a good example. Mr. Syrrist mentioned how difficult it is sometimes to get the information out of individual firms that have innovated in some way. We in fact have used a non-governmental entity, an industry-initiated data collection process where everything is kept blind, but we have a complete inventory of those kind of technologies, and we ask for folks to provide us with information on what didn't work in a blind sense as well.

I might add that General Motors participated in this process, United Technologies, Texas Instruments, and all of our smaller industries around the country. About 600 facilities were surveyed in this process.

So, again, we have developed a third-party entity. It has no association with a regulatory agency, there's no inference that this information is going to be used in a regulatory sense. It's going to be shared among the industry for them to pick and choose the appropriate technologies. We went after control and pollution prevention technologies in the data survey. We think it's going to be a very helpful move in the direction that this bill attempts to move as well.

Senator BAUCUS. You expressed concern about proprietary information. Have you had experience that——

Mr. SONNTAG. Well, indeed we have. It's like pulling teeth at times to get information out of facilities. In the context that I've just described, we had a very difficult time. We went back and kind of went back through our information distribution or our information collection process and made sure that we had a completely blind response. We would eliminate geographical reference in certain cases, even the year that the companies were founded, that kind of thing, so that we could be absolutely sure that this information remained confidential.

Whenever, I'm afraid, there is a governmental entity hovering in the process somewhere, that reluctance on the industrial facility end becomes even more magnified.

Senator BAUCUS. Well, how do we deal with that?

Mr. SONNTAG. Well, again, it's been dealt with in a variety of ways, I think, recently. Our industry, in a self-initiated process. Also, a good many States around the country have put together institutes or agencies that are other than regulatory, technical assistance programs for the small businesses. I think that's the beginning of a good way to deal with the issue so that we can get some of the innovation that occurs really naturally at each individual facility, try and get that out in a public domain or at least within an industry sector so it can be used.

Senator BAUCUS. How do other countries handle this problem?

Mr. SONNTAG. Well, look at some of the information I've been reviewing. I'm not an expert by any means, but you go to Japan, and, as Mr. Syrrist has mentioned, they identify specific technologies, and that's basically what's used either to remediate or control pollution.

A very interesting example is, in responding to a congressionally mandated survey on metals reclamation technology, we have done a series of case studies here in the United States on central recovery for metals, obviously an interest to us. There is one instance where it has successfully been implemented here in the United States, two or three other instances where the regulatory structure, through whatever way, simply precluded putting together this cost-effective, low-risk technology for central recovery of metals. In fact, the company that now is running the one successful instance is marketing in Brazil, where the regulatory structure is going to allow that kind of collective action for the environment to occur.

Senator BAUCUS. In addition to allowing more innovation, verification, flexibility, and so forth; how else can we use market forces here to encourage venture capital? Mr. Syrrist?

Mr. SYRRIST. Near and dear to my heart. It seems to me that only economic and cost incentives can be used if you're going to get

behavior beyond what's required, and that's where this performance verification being established, similar to the locations just mentioned by the other gentleman here, is so important. But keep in mind, most of this is centered around proprietary manufacturing processes that are the basis of the business that these companies are in, and so you have to have some kind of credible, objective entity where you can go and test and demonstrate those things so you can prove their economic value of doing this.

We have an interesting deal now that we are looking at in terms of tracking waste with bar codes in the State of California. It will allow companies to identify exactly where their waste is so they can see whether they make more money reducing waste or increasing production. It's just a classic cost-benefit approach to where you want to spend resources. I can't get a significant number of users together in one room because of the fear of anti-collusion activity by the Government if they get together. These are things we need to address.

Senator BAUCUS. I encourage you to look into that. In another committee—the Finance Committee—we found that hospitals and other providers were concerned about collaborating together and running afoul of U.S. anti-trust laws, and it's fairly clear to me that although there's this perception out there that getting together and sharing would perhaps run afoul of the anti-trust laws, very often that's not the case. People have this very big worry and, therefore, just don't explore it as far as they should.

Mr. SYRRIST. That's true, and there are ways around it. I mean, usually you go through trade associations or some other sort of established entity.

Senator BAUCUS. Exactly. Now, the capital problem, is that something new in the last couple of years, or has that always been a problem?

Mr. SYRRIST. About 10 years ago, in most capital venture firms, at least.

Senator BAUCUS. Capital for commercialization?

Mr. SYRRIST. Yes. Most venture firms said that—we all suddenly turned green, and then we decided that we should probably allocate somewhere in the neighborhood of 10 percent of our capital in this area. I think what is probably not so obvious is that the food chain of capital, after we have invested, we are sort of patient, but three to 10 years is our sort of time limit on our money. We tend to sell off either to corporations or some other joint venture stepping stone into the public market.

I think what we don't remember is that the environmental sector is an extremely young industry, and there aren't established large providers who are in the business of commercializing those for economic profit, so we don't have that next segment of capital to hand these investments off to. Then we went to the public market instead, and, of course, as owners of public environmental technology stocks, we all know how wonderful that was, so now that sector has tended to not work.

So I think it is partly a function of just being a young industry, and that's, of course, exactly at the point where the foreign capital sources come in and sort of bottom fish.

Senator BAUCUS. Right. OK. Well, I'm about out of questions. Has anybody said anything that should be commented on? Either the earlier panel or anybody else said?

Mr. SYRRIST. If I could, sir, we feel that in general, if we can use models like, as I suggested earlier, the FDA, where we've been able to get up a system where I can take a medical device and implant it in people and somehow it's OK——

Senator BAUCUS. A lot of people say the FDA is too slow, that it takes forever to get something through it.

Mr. SYRRIST. True, but it is known, and as long as there is a known, I can estimate my risk. I'm willing to take technology risks all day long.

Senator BAUCUS. That's known. You had mentioned earlier that one of the problems with permitting is time. Is that so?

Mr. SYRRIST. Well, I guess the problem there is really more that even if I develop something to the lowest common denominator in terms of standard in the whole country, just performance isn't good enough to get it usable in other sectors of the country. But I think also that when we look at these issues, nobody is really looking for the EPA or anybody else to really select our solutions. I mean, there is a demonstrable not-so-good record on that, I guess——

Senator BAUCUS. Well, it seems to me beyond the problem of picking winners and losers, as I listen to all of you, basically you're saying we've got to work together and have a better partnership approach and create incentives for people just to innovate more and in a more coordinated way than we have in the past. That's basically what I hear most of you saying.

Mr. SONNTAG. I think that's true. I'd like to strike a blow in the provisions of the bill here to be sure that the Environmental Technology Advisory Council is an aspect of this that's preserved. It ameliorates some of my concerns about the ability of a group of Federal agency officials to make decisions about where the gaps are in technology, where we should fill those gaps.

Senator BAUCUS. OK. Well, thank you all very much. You've been very, very valuable with your help.

The hearing is adjourned.

[Whereupon, at 11:57 a.m., the committee adjourned, to reconvene at the call of the Chair.]

[Statements submitted for the record, and the bill, S. 978, follow:]

Statement of John H. Gibbons

Director, Office of Science and Technology Policy

before the

Committee on Environment and Public Works

United States Senate

May 21, 1993

ENVIRONMENTAL TECHNOLOGY

Mister Chairman, members of the Committee, thank you for this opportunity to testify on how the Administration and this Committee can work together to accelerate the development and application of new environmental technologies, an effort that will both protect the environment and generate new, high-paying jobs.

As you know, the Administration is deeply committed to protecting the environment, and believes that technology has a key role to play in this area. The FY94 budget request included a number of new initiatives that will accelerate the development, dissemination, and application of environmental technology, such as:

(1) expanding Federal funding for the development of environmental technologies, energy conservation technology, and alternate energy technology;
(2) implementing an energy tax that will reduce energy use and associated pollution;
(3) expanding energy efficiency programs by 35 percent to improve the energy efficiency of Federal buildings, Federally-subsidized housing, transportation, and industry;
(4) expanding the Environmental Protection Agency's Green Lights program in order to encourage more businesses to utilize more efficient lighting and appliances; and
(5) accelerating the clean-up of hazardous waste sites.

In addition, just a few weeks ago, on Earth Day, the President released a white paper on protecting the global environment, which included the following initiatives:

(1) doubling the use of alternative fuel vehicles in the Federal fleet;
(2) using Federal purchasing power to buy energy-efficient computer technology and other environmentally-friendly products like recycled goods; and
(3) producing a Climate Action Plan that will call on American creativity and ingenuity to find new technologies for reducing greenhouse gas emissions.

These programs are a key part of the Administration's overall environmental strategy, which includes significant new investments in environmental programs in FY94 and over the next five years. These investments will pay huge dividends for years to come in terms of a cleaner environment, better health for our citizens, and reduced energy consumption. In addition, this investment will create new jobs in the rapidly growing environment products and services industry, an industry the United States has historically dominated but in which other countries, particularly Japan and Germany, have become leading players.

ENVIRONMENTAL TECHNOLOGY

The President firmly believes technology can help provide solutions to many of the environmental problems we face. It can help us detect, monitor, and treat pollution, but more

importantly it can dramatically reduce the amount of pollution produced in the first place. For example, the most cars produced today emit less than 5 percent of the pollutants produced by cars on the road thirty years ago. This improvement was made possible by electronic fuel injection, catalytic converters, lighter materials, and dozens of other technological innovations. Technology has led to similarly dramatic reductions in pollution from steel mills, chemical processing plants, and hundreds of types of other facilities as well.

In many cases the technologies used to save the environment can save money as well. The Vice President often points out that pollution is a sure sign of inefficiency since, after all, pollution represents wasted materials and wasted energy. Thousands of U.S. companies have found that pollution prevention makes sense not only for the environment, but also for their bottom line. Michael Porter, from Harvard University, has argued that companies in countries with stricter environmental regulations tend to use more advanced technology, which makes them more competitive in world markets. In addition, companies forced to develop new technologies to meet strict regulations have been in the forefront in selling environmental technologies in other countries adopting similar regulations.

A wide range of technologies can be called "environmental technologies." If you list every technology that can be used to clean up or prevent pollution, you end up with a very long list that would include almost all the "critical technologies" that the Defense Department, the Commerce Department, OSTP, and almost every major country have determined are key to their economic well-being and national security, including:

(1) advanced materials;
(2) advanced manufacturing;
(3) computing and telecommunications technology;
(4) micro-electronics; and
(5) biotechnology.

This shows how difficult it can be to define the phrase "environmental technology" and how futile it would be to consider environmental technology in isolation from other technologies.

Sometimes I find it useful to divide environmental technologies into two categories. Congressman George Brown and others have called these two categories "dark green technologies" and "light green technologies". Dark green technologies are developed to solve particular environmental problems. For example, a filter or a treatment process that removes lead or hydrocarbons from water would be an example of a dark green technology. The catalytic converter is another example.

On the other hand, light green technologies may serve many purposes, most unrelated to environmental protection. For instance, advanced manufacturing technology was developed to reduce defect rates and thus improve quality and productivity; but it can also reduce waste and energy consumption. The development and use of such technologies can be justified

without even considering the environmental benefits. Yet, it may be that light green technologies will, in the long run, provide more environmental protection than dark green technologies. Clearly, for our policies on environmental technology to be effective, we must promote the development and use of both shades of green technology.

The most cost-effective way for the government to do this is by making development of green technology an integral part of Federal technology programs throughout the government. Our goal should be to encourage Federally-supported researchers developing new technologies to consider environmental applications of their discoveries, whether their work is supported by the Defense Department, NASA, the Department of Commerce, or some other agency. Unfortunately, too often agencies focus too narrowly on their missions and miss the opportunity to explore how the technologies being developed in their labs might be used by other agencies and by the private sector to fulfill other missions as well. For instance, the same sensors that the Defense Department has developed to detect minuscule traces of nerve gas and other chemical agents could be used to monitor and track air pollution--if the money and the technical talent were available to explore that possibility. In many cases, finding technological solutions to environmental problems does not require developing new technologies, it merely requires finding new uses for existing technologies.

ENVIRONMENTAL TECHNOLOGY AND FEDERAL TECHNOLOGY PROGRAMS

Most scientists and engineers in Federal technology programs are not experts on the environmental problems facing this country and the world. One consequence of this is that Federal technology agencies may be devoting billions of dollars to solving second-order environmental problems, while overlooking more pressing ones. In addition, even if researchers did identify a technology that might address a pressing environmental problem, too often mission agencies do not have funding to allow them to explore the possibility because the development of new environmental technologies is not included in the mission of the agency.

In contrast, the Environmental Protection Agency, which is well-equipped to identify the country's most pressing environmental problems, does not have all of the technical talent and the facilities needed to develop the wide range of new technologies that could help monitor, clean up, and prevent pollution. This is not surprising, since the vast majority of EPA's staff and resources have been devoted to its regulatory mission.

We must build better links between EPA and the technology agencies like the Department of Commerce, the Department of Energy (DOE), the National Science Foundation (NSF), the U.S. Department of Agriculture (USDA), and NASA. This would give EPA regulators a better idea of what technology can and cannot do to reduce pollution and equally importantly it would help Federally-supported scientists and engineers at our national labs, in our universities, and in industry identify where their research might provide important environmental spin-offs. It is particularly important that technology agencies work with EPA

to anticipate the need for new technologies to meet future regulations. The Japanese have been particularly effective in this area. For instance, in order to implement the Montreal Protocol banning CFCs and other ozone-depleting chemicals, the Japanese government worked closely with industry to find new substitutes. There have been similar programs in the United States; NASA has worked with the aircraft industry on a focussed research program to reduce aircraft noise so that U.S. aircraft can meet FAA airport noise regulations. NASA has also signed a memorandum of understanding with EPA that establishes a framework for cooperative activities by which the two agencies can share their unique expertise and research capabilities. Unfortunately, this kind of inter-agency coordination is far too rare.

In addition to these problems with the development of new environmental technologies, there are also barriers to the application of these technologies. One problem is technology transfer. Developing new green technologies does little good if they stay in the lab. We need to ensure that Federal technology transfer programs do a better job of transferring green technology to the private sector and the marketplace.

Another way to expand the use of new environmental technology is through technology extension programs, like the Manufacturing Technology Centers of the Department of Commerce's National Institute for Standards and Technology. These programs are designed to help companies explore how new technologies can help them compete better by improving quality and reducing costs. We need to see that such extension programs help companies protect the environment as well.

Finally, we need to promote foreign trade. According to the OECD, the worldwide market for environmental technology is projected to grow from $200 billion today to at least $300 billion by the year 2000. Unfortunately, most of the American companies providing environmental goods and services are relatively small and need special assistance in locating and selling into foreign markets. We need to make sure that Federal trade promotion programs help these companies exploit this expanding world market.

Of course, the biggest challenge of all is that we do not have a lot of new money to devote to these efforts. That is why the Administration has focussed on using existing programs and mechanisms to help accelerate the development and application of green technologies, and why it is essential that we mobilize private sector creativity. (After all, it is the private sector that is the source of most new civilian technology development in this country.)

THE ADMINISTRATION'S TECHNOLOGY INITIATIVE

On February 22, the President and the Vice President visited Silicon Valley and released a 36-page technology policy paper entitled "Technology for America's Economic Growth--A New Direction to Build Economic Strength." I have submitted copies of the paper

with my testimony and additional copies are available from my office. This Technology Initiative provides a comprehensive strategy for using technology to meet a number of national goals. To quote the opening paragraph of the document:

> Investing in technology is investing in America's future: a growing economy with more high-skill, high-wage jobs for American workers; a cleaner environment where energy efficiency increases profits and reduces pollution; a stronger, more competitive private sector able to maintain U.S. leadership in critical world markets; an educational system where every student is challenged; and an inspired scientific and technological research community focused on ensuring not just our national security but our very quality of life.

The Technology Initiative lays out three broad goals:

(1) Long term economic growth that creates jobs and protects the environment.
(2) A government that is more productive and more responsive to the needs of its citizens.
(3) World leadership in basic science, mathematics, and engineering.

The first goal reflects the Administration's strong conviction that we do not have to make a choice between economic growth and environmental protection. With well-designed environmental regulations and use of new technologies, we can have both.

The Administration has several initiatives to promote development and use of environmental technologies, including:

(1) Funding for a new EPA-led, multi-agency program to develop and promote the application of environmental technologies.
(2) Creation of a new subcommittee of the Federal Coordinating Council on Science, Engineering, and Technology to provide high-level coordination of agency programs to develop environmental technologies.
(3) Formation of a Clean Car Consortium involving Federal agencies, the Big Three auto companies, and other companies in an effort to build a cleaner, more efficient automobile.
(4) Formation of a multi-agency committee led by the Department of Commerce and involving EPA, the Energy Department, and OSTP, to promote commercial use of environmental technologies both here and abroad.
(5) Re-directing Federal laboratories, especially the Department of Energy labs, to focus their resources on environmental and energy technologies.

The new multi-agency program being established at EPA is designed to leverage existing Federal technology programs and bring together people at EPA, who can identify our most pressing environmental problems, with scientists and engineers in other agencies, who can identify technologies that could be used to address those problems. For FY94, the

Administration is requesting almost $36 million for this program. Two-thirds of this funding would be for contracts with other agencies to develop and promote the use of new environmental technologies. Some of this money would be spent at Federal laboratories, but most of it would probably be awarded as competitive grants and contracts to industrial and university researchers working on leading-edge technologies through programs like the Advanced Technology Program at the Department of Commerce, the grant programs at the National Science Foundation, or the Superfund Research Program of the Department of Health and Human Services (HHS). These existing programs have been very successful in identifying and funding top-flight scientists and engineers who have used the grant money to develop "generic" technology that helps make American companies more competitive. With the funding provided by this new program, these programs will be able to target those technologies that provide environmental benefits as well.

While it may seem somewhat complicated, this multi-agency approach provides many benefits. It creates links among Federal researchers and EPA environmental experts, ensuring that technologies developed under the program address critical environmental needs. It will accelerate the "greening" of federal technology program at the Department of Commerce, the Department of Energy, USDA, and elsewhere and puts environmental technology is on the agenda of every Federal research agency. Most importantly, this approach, by building on existing technology programs, can provide immediate, tangible results.

In contrast, if we were to create a new, separate environmental technology program within a single agency, it would take several years to build an effective program. And it would probably be quite difficult to assemble all the top-flight expertise you need in one place. Because environmental technology includes everything from advanced materials to bioremediation to energy conservation, you would need a large technical staff with a diverse background. In addition, you would need people who understand business to evaluate whether a given technology could succeed in the marketplace. Assembling such a diverse staff at any one agency, particularly at an agency like EPA, whose first priority is not technology, would be difficult, time-consuming, and costly. Creating a new environmental technology program at one of the technology agencies may take a little less time, but would require replicating much of the expertise presently available at EPA. Better to create a "virtual program"--similar to so-called "virtual corporations"--that combines the strengths and resources of several agencies. This has the added benefit of making environment technology a priority at every technology agency rather than relegating it to one particular agency or program. This approach has been tried before in the 1970s with the Federal Interagency Energy/Environment R&D Program, which proved to be very successful. Unfortunately, it was eliminated at the start of the Reagan Administration.

To provide high-level coordination for this program and other multi-agency efforts, my office has created a subcommittee of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), which will focus on environmental technology. I chair the FCCSET and the acting chairman of this new Federal subcommittee is Joe

Bordogna, the Assistant Director for Engineering at NSF. Other agencies involved include EPA, DOE, NASA, USDA, HHS, the Department of Commerce, and others. Working together, these agencies will identify opportunities for joint programs and coordinate their individual efforts to develop environmental technologies to ensure that there is no duplication of effort or missed opportunities. One of their first tasks will be to conduct an inventory of on-going technology programs that are or could provide funding for development of new environmental technologies.

The Administration's efforts will help ensure the United States is at the leading edge in environmental technology. They will not only help us protect our environment but will also help American companies capture a larger share of the huge, growing world market for pollution monitoring, clean-up, and prevention technologies.

S. 978, THE NATIONAL ENVIRONMENTAL TECHNOLOGY ACT OF 1993

I commend Senators Baucus, Lieberman, Mikulski, and the other cosponsors of S. 978 for their leadership on this issue. We share your desire to improve Federal efforts to develop and disseminate environmental technologies and look forward to working with you on this legislation to achieve our common goals, including:

(1) providing better coordination between Federal agencies developing environmental technologies;
(2) redirecting Federal technology programs to focus more on protecting the environment;
(3) more closely linking the EPA regulatory process with technology development;
(4) accelerating the diffusion of environmental technologies;
(5) promoting export of environmental technologies; and
(6) encouraging the use of better, more cost-effective technologies for the clean-up of hazardous waste sites.

Since the bill was only introduced on Wednesday, the Administration has not had time to fully review the legislation and so I am not able to provide detailed comments on the language at this time. However, we are concerned that some of the more prescriptive provisions of the legislation will limit the flexibility of the Administration in achieving our common goals. Particularly in an area like technology development, it is essential that the agencies have the flexibility needed to take advantage of new opportunities as they arise, without being bound by old, out-dated, or inappropriate structures or requirements. For instance, while we welcome your support for an interagency FCCSET committee on environmental technology--like the one we recently established--having such a committee and its functions specified in detailed legislation could make it more difficult for the committee to function effectively and respond to changing demands and opportunities. Another concern would be the number of annual reports required by the legislation and the Environmental

Technology Advisory Council created by the bill, which may in the future prove unnecessary or redundant.

I will get back to this Committee soon with additional detailed comments on the legislation and suggestions for ways to improve it. I look forward to working with this Committee and other committees of jurisdiction to perfect this legislation and implement it. Thank you again for this opportunity to testify. I would be happy to answer any questions you might have.

TESTIMONY OF HON. ROBERT M. SUSSMAN, DEPUTY ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY

Thank you, Mr. Chairman. It is a real pleasure to appear before you and the Committee to discuss the important subject of environmental technology and the National Environmental Technology Act. I want to congratulate the Committee and the bill's sponsors for their leadership on this issue. As you know, technology innovation is an issue of great importance to this Administration. A proposal for a new Environmental Technology Initiative is included in the President's 1994 budget request. We believe the goals of the legislation that is the subject of today's hearing are consistent with President Clinton's call for investing in the technological future of America. We look forward to working with the bill's sponsors and the Committee to enhance its provisions and make it complementary to our existing programs and initiatives.

In my testimony today, I will discuss three topics: the Administration's views and initiatives related to environmental technology innovation, EPA's role in environmental technology development, and the Agency's comments on the National Environmental Technology Act.

Administration Views and Initiatives

In the past, the environmental debate has been distorted by a false dichotomy between environmental and economic goals. This Administration believes that economic growth and environmental protection are compatible. In fact, we believe that well-crafted regulations and environmental programs can encourage innovation, promote competition, and improve our environment. A sound environment, in turn, can spur economic growth. Government efforts to promote technological innovation can and must be a vital component of our nation's environmental infrastructure.

Although we have made great environmental progress in the United States, many environmental problems remain intractable or expensive to resolve. In addition, in the absence of rapid technological advance, population and economic growth will increasingly overcome our ability to maintain environmental quality and compete economically. Thus, facilitating the development and use of innovative technologies is critical to EPA's success in fulfilling its mission. Further, for economic and environmental protection reasons, we must ensure that U.S. industry is at the forefront in providing environmental solutions to the rest of the world. The cost of failure is high.

In recognizing these pressing problems, the Administration realizes that the government can play a role in bringing environmental technologies to the global market. As you know, this Administration has acted swiftly to propose an environmental technology program that will stimulate investments in innovation and coordinate environmental technology efforts throughout the federal government. The Administration has proposed a $36 million Environmental Technology Initiative in the FY94 budget now before Congress. We view this proposal as the initial step in a multi-year initiative to integrate and improve federal efforts to support environmental technology innovation and diffusion.

The Administration has also established a technology policy initiative under the leadership of the Vice President. This effort is being coordinated by the White House's Office of Science and Technology Policy and the National Economic Council.

In addition, on Earth Day, the President asked the Department of Commerce (DOC), working closely with EPA and the Department of Energy (DOE), to develop a strategy to increase exports of U.S. environmental technologies and to improve our competitiveness in the growing world market for environmentally sound products and services. To support this strategy, a successful technology program must produce cost-effective solutions to international as well as domestic environmental problems. In the context of this effort, work is already underway to catalog existing federal environmental technology programs. I believe that better coordination of these programs is an important first step. EPA is playing a major role in this effort and is involved in related interagency workgroups on small and growing businesses, infrastructure, and broader technology issues.

As a part of these initiatives, EPA is forging partnerships with other key agencies including the Departments of Commerce, Energy, State, NASA, USDA and the Export-Import Bank. All of these agencies share our belief that technological innovation is a key to improved environmental protection and economic growth. The career staff at EPA tell me that EPA and these other agencies are working together more cooperatively than ever before. This teamwork creates a great potential for

success, and one that will only be enhanced by a close working relationship with Congress.

EPA's Role in Environmental Technology Innovation

I would now like to turn to a discussion of EPA's role in environmental technology innovation. EPA's primary role in these efforts has been, and will continue to be, to help facilitate technological innovation and disseminate credible technology information. We have several strengths to offer in this regard:

(1) The environmental technology market is created and shaped in large part by EPA and state regulatory, permitting, and enforcement programs. Most EPA regulations specify which parties will be regulated and define required environmental performance. Thus, EPA can anticipate future technology needs and adopt rules and implementing policies that facilitate the development and use of technology solutions. For example, marketable emissions credits or similar economic instruments can be a major incentive to encourage use of innovative technologies. As a further example, EPA, by focusing on performance in the implementation of standards, can encourage the development and use of pollution prevention solutions.

(2) Innovative technologies must gain regulatory acceptance by permit writers, on-scene coordinators, and rule developers before they can be used for compliance purposes. EPA's involvement in technology development and testing programs can lend credibility and enhance a new technology's ultimate acceptability.

(3) EPA is viewed throughout the world as an objective, honest broker whose reputation can enhance the domestic and foreign acceptance of new technologies. EPA's outstanding scientists, engineers, laboratories and testing facilities can play a critical role in the success of new technologies by contributing to the development of better solutions, by cooperating in testing, and by standardizing the quality of performance data.

In the past, EPA has applied these strengths by undertaking, together with other agencies, a number of responsibilities, including:

Collaborating on Technology Development

EPA is a successful developer and evaluator of environmentally useful technologies—with industry, other agencies, and independently. We have been increasing our joint efforts with industry in a number of ways. In the "Design for the Environment" program EPA works with industry and with collaborative research programs to identify process and raw material modifications that can prevent the production of pollution. In the Source Reduction Review Project (SRRP), EPA is coordinating the development of regulations for each of 17 industrial categories. By working with industry during this process, we can help industry anticipate the need for environmental improvement in time to identify pollution prevention approaches or design and engineer better pollution control methods. Further, EPA is working successfully with industry to commercialize innovative technologies under the provisions of the Federal Technology Transfer Act (FTTA). The FTTA provides enhanced opportunities for collaboration while protecting intellectual and other property rights of the participants. We are also expanding our collaboration with the Department of Energy's Office of Industrial Technology, which has a substantial program oriented toward cooperative development of industrial technologies.

Enhancing Performance Credibility

A major emphasis in EPA's technology research and development program is evaluating the performance of innovative technologies. The Superfund Innovative Technology Evaluation (SITE) program and the Municipal Waste Innovative Technology Evaluation Program (MITE) independently test innovative technologies in cooperation with the private sector. The tests are conducted under real world conditions and use generally acceptable test methods and protocols. The results are widely disseminated. The purpose is to corroborate the cost-effectiveness of these technologies to give potential users a credible basis for determining which technology to select. We recently, in collaboration with the Departments of Defense and Energy, began a program for the testing of environmentally useful technologies at federal facilities.

Convener and Promoter

EPA increasingly assumes the role of convener, catalyzer, and coordinator. Recent examples of this work include the EPA Bioremediation Action Commit-

tee and workshops on combustion technology, municipal solid waste technology, green process modeling, and innovative physical separation technologies.

Development Financing

EPA has been funding development of innovative technology through grants and cooperative agreements for years. Because of budget limitations, EPA programs generally focus on the less costly initial stages of development. A number of technologies developed by EPA have now been licensed to the private sector under terms of the FTTA. Government financial support is limited, however, and there is a gap in the availability of public and private sector financing, particularly for small companies, during the middle and later stages of development (i.e., large pilot, prototype scale-up, demonstrations).

Business Assistance

EPA has only limited experience in providing business assistance. EPA helped establish the National Environmental Technology Applications Corporation (NETAC), which assists developers with business plans, market analyses, patenting, licensing, and other activities, and provides information about regulations and regulatory processes. EPA is also developing a new program, U.S. Technology for International Environmental Solutions, consisting of a consortia of federal agencies and private interests that would attempt to provide credible information on the cost-effectiveness of U.S. solutions to foreign environmental problems.

Technology Diffusion

EPA assists in technology transfer through publications, clearinghouses, workshops, training courses, and conferences. These technology diffusion efforts are usually program-specific. We have introduced an emphasis on pollution prevention in many of our technology diffusion programs.

While these programs have yielded important results, we believe much more is possible.

Comments on the Bill

From the perspective of EPA's experience and unique relationship to environmental technology issues, I would suggest that there are certain basic principles that should guide the development of our policies and programs in the technology innovation arena. These principles are reflected in our comments on the bill:

(1) We must forge partnerships among government agencies and with the private sector to increase the effectiveness of technology innovation efforts and the pace of technological change.

(2) Government must focus on more than just environmental technology development. We need to identify incentives we can use in our environmental management programs to foster innovation and, as appropriate, provide information and other services that will help firms in their innovation, diffusion, and commercialization, as well as identify other opportunities where our regulatory programs can be modified to enhance environmentally sound technology development and diffusion efforts.

(3) The scope of our efforts must extend beyond pollution control and site remediation. We need to be supportive of process changes in industry that promote pollution prevention as the preferred strategy of environmental protection.

We look forward to working with you on this legislation to achieve our common goals of improving federal efforts to develop and disseminate environmental technologies.

Specifically, we believe that EPA's role can be improved by the addition of a new office for environmental technology similar to that envisioned in Title II of the bill. EPA's in-house Innovative Technology Council currently serves to link our technology programs, but a central point of focus would provide a greater impetus to integrate all of EPA's efforts in this field and would support government-wide program integration. Moreover, such an office would highlight the importance of environmental technology innovation as an environmental protection strategy and an engine of economic growth.

The Agency also supports the concept behind the Environmental Innovation Research Programs provided for in Title III of the bill. We concur with the sponsors' assessment that helping encourage environmental technology innovation should be a key component of the U.S. Government's major environmental cleanup programs.

The sponsors of the bill are clearly aware of the "credibility gap" that inhibits commercialization of environmental technologies developed by small businesses. The testing and reporting programs described in Title III, Subtitle B and Title IV, Subtitle A of the bill will augment existing efforts to address this barrier to technology development. We support the goals of this endeavor as well.

Finally, although the Agency endorses the broad concept of the National Environmental Technology Panel created under Title I of the bill, I will defer discussion of this provision to Dr. Gibbons, since the Office of Science and Technology Policy which he directs will play the lead role in the Panel.

While the Agency supports the goals of the bill, we have, however, several concerns that we hope to work with the Committee to resolve. First, we want to make sure that the bill creates a more effective role for government in the entire technology innovation process. For example, the bill should be clearer in providing that EPA:

- Consider a wide range of technologies in programs authorized by the bill, as EPA does in existing programs. We believe that if EPA is to become a successful partner in environmental technology innovation, it will need consistent authority to pursue the whole range of environmental technologies including pollution prevention, recycling, pollution control, remediation, compliance monitoring and site assessment, and information management.
- Have flexibility with respect to matching funding requirements for projects. The public/private fund matching requirement is critical to assuring that technology supported will be targeted on real-world problems. We are concerned, however, that quantitative match requirements for funding eligibility under Titles II and III will preclude many small businesses from participating and may preclude other useful kinds of cooperative efforts as well.
- 2

Second, we agree with the bill's focus on increasing the credibility of performance data on innovative technologies and enhancing the process for disseminating performance data. Industry will not use—and regulators will not approve—innovative technologies unless they have confidence in the data. We are concerned, however, that EPA is not well situated to certify the performance of all technologies in all circumstances in which they can be used. The Agency clearly could develop, collect, and publish credible performance data, but should not be in the role of making certification decisions. Such a process is extremely resource-intensive, raises liability concerns, and may even delay diffusion of innovations while users await government data.

Finally, I would like to note, in reference to the creation of an Environmental Technology Advisory Council in Title IV, Subtitle B, that on February 10, 1993, the President signed Executive Order 12838, "Termination and Limitation of Federal Advisory Committees," ordering each agency to prepare, within 90 days, a detailed review of all existing advisory commissions. Agencies are in the process of submitting to OMB their recommendations regarding which advisory commissions are unnecessary and should be terminated. As a general policy and pending completion of this review, the Administration does not support provisions that would establish or reauthorize advisory commissions.

Thank you again, Mr. Chairman, for the opportunity to provide comments on this important legislative initiative. If the United States is to have a competitive economy and sustainable environment, we need to promote and facilitate environmentally useful technology innovation. Government programs are only now beginning to give technology development the attention it deserves. EPA congratulates you on your efforts in this regard and looks forward to working with you as the Committee further deliberates and refines its bill.

FOLLOW-UP QUESTIONS FOR THE RECORD FROM SENATOR FRANK K. LAUTENBERG

1. While technological innovation is critically important, the environmental needs of many nations—particularly developing nations—can be met with lower tech solutions.

Q: What can be done to assist U.S. firms export to these countries the broad *array* of environmental goods, services, and technologies?

A: In response to the President's Earth Day speech, an inter-agency task force has been convened, led by the Department of Commerce and with the participation of EPA, Department of Energy (DOE), and other agencies, to develop a government strategy for exporting U.S. environmental goods and services. Federal

agencies need to coordinate their programs, paying particular attention to the needs of this diverse industry composed of both very large and very small firms. EPA, for its part, already participates in a number Of programs that either promote the export of or build capacity for U.S. environmental technologies overseas, as shown below:

Trade Promotion Coordinating Committee (TPCC). EPA actively participates in the Commerce-chaired Trade Promotion Coordinating Committee (TPCC).

U.S.-Asia Environmental Partnership (US-AEP). EPA is also involved in the U.S.-Asia Environmental Partnership (US-AEP), a coalition coordinated by AID that provides opportunities for the federal government and U.S. business to work together to develop environmental training, technology transfer, and environmental infrastructure in Asia.

U.S. Environmental Training Institute (USETI). EPA, in joint venture with the private sector and with support from the Agency for International Development (AID) and Trade Development Agency (TDA), established the U.S. Environmental Training Institute (USETI), a non-profit institute that offers U.S. corporate-sponsored environmental training courses to overseas public- and private-sector executives in order to give key decision makers exposure to U.S. technologies and approaches that can be incorporated into their local industries and governments.

Green Pages. In May 1993, EPA and Commerce issued the first "*Green Pages,*" an environmental supplement to the Department of Commerce's *Export Yellow Pages,* which lists over 1,000 U.S. environmental companies that are eager to provide their products and services overseas.

Tiete River (Brazil) Mission. EPA, in cooperation with other agencies, recently co-sponsored a "reverse" trade mission for Brazilian officials on the clean-up of Brazil's Tiete River. This project allowed Brazilian industry and political leaders to visit U.S. cities that have enacted similar river clean-ups and to see "showcased" U.S. technology in action. As a result, the Governor of Sao Paulo has asked EPA to play an active oversight role on this project; the mission laid important foundations for future prevention, restoration and planning work, and cooperative research.

Environmental and Energy Efficient Technology Transfer Clearinghouse. EPA has established, with AID and DOE, this "one-stop shop" clearinghouse on energy efficient and environmental technologies, vendors, regulations, other data bases, and related environmental information. Now operated by the World Environment Center, clearinghouse stations are currently set up in Mexico City, Vienna, and Washington, and are scheduled for other Caribbean and Latin America sites.

National Advisory Council for Environmental Policy and Technology. EPA participates in the activities of the Trade and Environment and the Technology Innovation and Economics Committees of the National Advisory Council for Environmental Policy and Technology (NACEPT).

Environmental Business Council of the U.S. EPA is exploring cooperative activities with the Environmental Business Council of the U.S., a new association of U.S. "envirotech" firms that actively networks its members with potential foreign clients. The kick-off meeting is in Washington, June 8–9.

U.S.-ASEAN Council for Business and Technology. With great reception, EPA has accompanied U.S.-ASEAN (Association of Southeast Asian Nations) Council members on environmental trade missions to Thailand, Indonesia, and Singapore. The Council and its membership work to develop environmental export opportunities in the ASEAN region.

AID-EPA Environmental Pollution Prevention Project (EP3). EP3 is a joint EPA-AID project aimed at preventing pollution in developing countries. Planned activities include training, technical assistance, and the establishment of clearinghouses in developing countries.

Innovative Technology Council. At the forefront of innovative technology dissemination at EPA, this Council joins EPA's program offices in efforts to identify and strategize new opportunities for EPA to introduce and disseminate innovative U.S. environmental technologies and practices.

Energy Efficiency Centers in Eastern Europe. EPA and DOE have established Energy Efficiency Centers in Poland, Russia, and Czechoslovakia that identify domestic and foreign partners for joint ventures; facilitate technology and information transfer; sponsor training and demonstration; and provide policy recommendations to government.

National Environmental Technology Applications Corporation (NETAC). NETAC, a non-profit organization created by EPA and the University of Pitts-

burgh Applied Research Center, works to accelerate environmental technologies into the marketplace by providing technical assistance, technology demonstration and evaluation, surveys of domestic and foreign markets, and helping innovators commercialize their technologies.

2. S. 979, the Global Greentech Jobs Initiative Act, is based partly on a report issued by former EPA Administrator William Reilly, *Global Markets for Environmental Technologies: Defining a More Active Role for EPA within a Broader U.S. Government Strategy.*

Q: Does your Administration support this report?

A: The Working Group on Environmental Technologies and Trade has been charged by the President with formulating a strategy to increase exports on U.S. environmental technologies and is considering a wide number of proposals, including those set out in the report.

This report, the product of an internal EPA work group's efforts to identify how the Agency can better contribute to Federal initiatives to promote U.S. environmental goods and services abroad, made a number of recommendations to the EPA Administrator—which have been or are currently being acted on. First, the report recommended that EPA expand cooperative programs with other Federal agencies. Such work is currently underway through the TPCC and under the strategic Commerce-DOE-EPA committee formed in follow-up to the President's Earth Day speech. Second, the report recommended establishing an inter-agency initiative, "U.S. Technology for International Environmental Solutions (U.S. TIES). This idea has been taken up in implementing the President's Environmental Technology Initiative. Third, the report recommended that EPA establish a coordinating body within the Agency, and this role has been assumed by EPA's Innovative Technology Council.

Q: What steps will this Administration take to implement the report?

A: As noted above, the Administration is currently formulating its strategy and will carefully consider and review all of the proposals set out in the report.

Q: Does the Administration support S. 979?

A: At this time, the Administration has not taken a formal position on S. 979. The Administration supports the basic goals and objectives of increasing the expert of U.S. environmental technologies, but until the interagency Working Group developing the Administration's export promotion strategy completes its work, it would be premature to endorse any one particular approach to increasing exports on environmental technologies. We share your belief that it is important for both the environment and the economy that the U.S. encourage a strong environmental technology industry that can complete effectively domestically and internationally.

As I indicated in my testimony, the Administration has identified technology, including the development of". . . advanced environmental systems and treatment techniques that can yield environmental benefits and increase exports of 'green' technologies . . ." as a major policy theme. This theme was reflected in the U.S. Technology for International Environmental Solutions (U. S. TIES) component of the President's 1994 EPA budget now before Congress. EPA believes that the goals of S. 979 are consistent with the TIES program. We look forward to further coordination with your Committee as these issues develop.

Q: Does the Administration have any comments on S. 979?

A: Please see answer to question above.

3. The report also says that the EPA is engaged in a comprehensive effort to strengthen and build the environmental infrastructures of Eastern Europe and the developing world. That is a fantastic way to increase the demand for American goods, services, and technologies.

Q: Can you give us an update on what you are doing in this area?

A: Please see answer to question 1.

FOLLOW-UP QUESTIONS FOR THE RECORD FROM SENATOR JOSESPH I. LIEBERMAN

Q: You testified that the requirements contained in Titles II and III of the bill regarding private sector matching of public funds may be too inflexible, especially for small business. How should they be modified? Should we change the bill in other ways to ensure small businesses have ample opportunity to participate?

A: The bill contains requirements regarding private sector matching of public funds for projects, and specifies that the federal share must not exceed 50% of the total cost. While this is appropriate for most activities, EPA should be permitted to modify and/or waive the match requirement for small businesses, as appropriate.

Statement of

R. Darryl Banks, Ph.D.

Director,

Program on Technology and the Environment

World Resources Institute

before

the Committee on Environment and Public Works

of the United States Senate

in connection with hearings on

S. 978, the National Environmental Technology Act of 1993

May 21, 1993

Good morning Mr. Chairman and thank you for the opportunity to testify on the issues underlying S. 978, the National Environmental Technology Act of 1993.

We are here today because there is growing interest in the realization that environmental quality is consistent and indeed conducive to a healthy climate for economic growth. An important factor in achieving environmental and economic progress is the development and use of environmental technologies. There is a growing concern over the role of environmental technologies and American competitiveness. And there is reason for such concern.

The new world market for environmentally superior technology is large and growing rapidly. The insight that environmental performance can strengthen competitiveness permeates the industrial policies of our major trading partners. It has quietly taken hold among the best American companies too, but the United States has been slow to grasp the connection and to revamp its environmental and technology policies accordingly.

Reorienting R&D priorities and funding is crucial if our nation is to develop new technologies that solve environmental problems and that pave the way for economic growth and competitiveness.

Political leaders the world over will be called upon to guide and speed this transformation in the coming decades. The business community here and abroad can expect public demand for environmental performance--already high--to rise steadily and to increasingly determine economic viability. Dirty or dangerous activities and products will be regulated or priced out of the market, and a premium will be placed on environmentally advantaged technologies, including emissionless vehicles, photovoltaic electricity, bioengineered pest resistance, and zero-discharge manufacturing.

At the World Resources Institute, we have undertaken an array of studies aimed at identifying technologies and practices that are critical to environmental progress and environmental competitiveness. We have not been alone; many other institutions, including the National Academy of Sciences and the Carnegie Commission, have examined these issues. And it is noteworthy to realize the convergence of findings and observations.

First, with a global population likely to double by the middle of the next century and worldwide demand for economic growth, only a massive transformation of today's products, processes and infrastructure through rapid and extensive technological change can prevent environmental and economic disaster.

Second, national science and technology policy in the U.S. does not reflect the

changed priorities arising from the end of the Cold War and the new salience of environmental issues both domestically and internationally. Priorities in the allocation of national R&D spending sharply skewed away from protection against environmental threats. For fiscal year 1992, about 7% of the public R&D monies supported environmental activities. Moreover, this skewing occurred not only at a macro level but also in the details of the selection of particular technologies deemed to be "critical" to the nation, an exercise in which environmental factors have played far too minor a role.

Third, U.S. environmental technology R&D suffers from a structural fragmentation that has made long-term planning and coordination extremely difficult to achieve. Federal environmental technology R&D funding is spread across at least eight different agencies and programs making it difficult to impose a coherent overarching policy to support innovation and diffusion of environmentally critical technologies. This situation can be contrasted to Japan where most of the public support for environmental technology is coordinated by a single ministry.

Fourth, environmental technology policy-making in the U.S. does not have a central focal point of coordination or a central coordinating mechanism. This lack of coordination manifests itself in the difficulties in establishing budget priorities, and in the support of often redundant and duplicative research.

Fifth, although private firms are active in marketing "environmental" technologies, a public role is justified to underwrite the more basic, generic technical knowledge needed to solve the next generation of environmental problems and necessary to keep U.S. firms competitive. Although the United States has led historically in the development of environmental standards and technologies to combat environmental problems, the lead in many areas has slipped out of American hands and other nations are forging ahead faster with the development of environmental technology policies to craft tomorrow's solutions.

There are, from our work and judgement, three basic tasks that must be accomplished if the U.S. is to develop a coherent environmental technology policy. One is to move environmental factors from the periphery, according them central importance as public support for technology development is apportioned. The second is to reform environmental regulation to make it an engine of technological change instead of a deterrent. The third is to expand the use of economic incentives to catalyze technology innovation. Accomplishing these broad tasks will take time. Legislative statutes must be changed and new legislation passed; new public and private sector partnerships must be established; and research and development funding must be strengthened and reoriented. Nevertheless, the key elements of an environmental technology policy that will improve U.S. environmental and economic performance are clear. To address these issues the following actions should be considered:

1. The creation of a civilian technology agency to support research and development of critical technologies and especially making environmentally critical technology one of its priorities would strengthen and focus federal support for research and development of generic environmentally superior technologies. A new agency could be modeled as a civilian image of the Defense Advanced Research Agency (DARPA), incorporating the managerial and structural elements that have been key to DARPA's success.

2. The development of a national strategy for environmental technology is a vital tool for long-term planning and coordination of policy and budgets. This strategy should include recommendations for identifying new programs; for improving agency coordination; for establishing new patterns of R&D cooperation, especially between the public and private sectors; and for reorienting ongoing R&D programs. An Environmental Coordinating Committee under the Office of Science and Technology Policy should be established to monitor and move forward on this national strategy.

3. In the short term, while the development of a national strategy is underway, the most important civilian R&D programs --the Advanced Technology Program, the National Manufacturing Centers Program, the National Science Foundation Engineering Research Centers-- should refocus their budget priorities on environmental technologies. Increased or reprogrammed funding would provide an immediate focus and emphasis on

environmental technologies in these key research programs.

4. A key action to accelerate the diffusion or use of environmental technologies would be to establish and implement an environmental technology-export assistance initiative. EPA could play a key role along with the Commerce Department in developing a new federal program to promote and expedite the export of environmentally superior technologies. This initiative would designate a lead agency to coordinate export-promotion programs; locate environmental market specialists in U.S. service abroad to identify new markets; and provide assistance to small and medium firms in exporting environmental technologies and services.

5. There should be an active initiative to make environmental and commercial concerns major thrusts in the missions of the National Laboratories. The substantial resources of the federal laboratories, comprising about one-sixth of the nation's technical personnel, could be key to the development of environmentally critical and energy-efficient technologies. The initiative should make more of the laboratories' activities pay-off commercially, especially through cooperative agreements with the private sector.

6. Economic and fiscal incentives can be key to stimulate investment in environmentally critical technologies. The replacement of environmentally burdensome processes and products can be accelerated through carefully structured investment tax

credits, R&D tax incentives and accelerated depreciation schedules. At the same time, economic and market initiatives that charge the full costs of pollution and energy inefficiencies would provide long-term incentives for investment in clean technologies.

7. Regulatory agencies, in particular the EPA, should be directed to propose changes in environmental regulations that would encourage and stimulate technology change. Many environmental laws favor old technologies over new. Relying on end-of-pipe pollution controls has tended to entrench existing technologies at the expense of long-term innovation. Pollution prevention and waste reduction approaches would promote "upstream" solutions and encourage innovations in process and product design. Regulatory policy that would promote innovation includes:

- performance based standards
- greater regulatory focus on pollution prevention and reduction
- increased and strengthened permit waiver procedures for new technologies, particularly for demonstration and testing projects; and
- amending the "grandfather clauses" that protect older, more polluting facilities from tough environmental requirements.

The need for technological solutions to the environmental issues critical to U.S. well-being and global security, as well as strong demand from the private sector argue

convincingly that a coherent set of policies, institutions and programs to support environmentally critical technologies should be a key element of both technology and environmental policy in the United States. In broad outline, these policies should further support the development and diffusion of environmentally critical technologies, these policies should establish a focal point within the federal government to coordinate environmental technology policy; these policies should lead to the development of a national strategy for environmental technology; and these policies should encourage and embody close and possibly new patterns of public/private sector collaboration. The breadth of these items and in particular the close connection of environmentally critical technologies to industrial technology in general suggests the common technology base and complementarity of environmental and economic objectives.

In Japan, Germany, the Netherlands and Canada, among other countries, environmental technology has already gained widespread support as a subset to industrial technology critical to national well-being. Industries in these countries combine a desire to solve environmental problems with the goal of strengthening national competitiveness by mastering environmentally sound technology. The strong public support in these advanced countries for environmental technology underscores its importance to U.S. environmental and economic progress.

Thank you Mr. Chairman and members of the Committee for the opportunity to present some of our findings and to discuss these issues. I would be happy to discuss them further in response to questions.

Remarks to
Senator Max Baucus
Chairman
Committee on Environment and Public Works
Senate Hart Office Building, Room 415
Washington, D.C. 20510
May 21, 1993

Ladies and Gentlemen,

I am honored to be able to present testimony to this Committee and apologize for not being able to attend in person. I am a founding general partner of Technology Funding and have been in the venture capital business for over a decade. Dag Syrrist, Technology Funding 's Manager of Environmental Operations, can ably convey the needs of the investment community regarding the commercialization of environmental technologies.

Technology Funding is a large California-based venture capital firm with over $300 million of capital raised. We have invested in over 190 portfolio companies covering a wide range of industrial sectors. The companies we have helped found and grow now employ several thousand people and produce revenues in excess of $1 billion. We are considered to be one of the leading firms investing in environmental technologies and sponsor the nation's largest conference on venture capital environmental investing. I serve on the EPA's National Advisory Council on Environmental Policy and Technology. Both Dag and I serve on the EPA's Technology, Innovation, and Economics (TIE) committee and chair the Technology Diffusion focus group reporting to TIE. We also serve on several advisory groups such as the National Laboratory Task Force, the California Environmental Technology Partnership, and Western Governors Association's advisory boards.

The venture capital community has been looking at the environmental technology business for nearly ten years. Five years ago, nearly every major venture firm was going to commit at least 10% of their investment portfolio to environmental deals as the area seemed ready to explode. Today there are fewer than fifteen venture firms that invest in environmental businesses and less than ten that invest in environmental technologies. In 1991, the venture capital community, with almost $40 billion under management, invested in only five new environmental technology companies. Technology Funding is perhaps the only firm willing to lead an investment in pre-permitted environmental technologies.

I have divided my remarks into two separate sections. The first section deals with those barriers that private sector risk capital faces in commercializing environmental technologies, regardless of the environmental problem solved or technology chosen to produce a solution. My remarks are also generic to the source and type of private sector risk capital employed. The second section is devoted to a review of the proposed bill, what we feel is valuable in the proposed legislation, and what we feel could be changed to produce a more effective bill.

The Environmental Technology Market

Environmental technologies and services is one of the largest and fastest growing markets of the 1990s. Total expenditures for pollution control and prevention activities rose from $98 billion in 1987 to $115 billion in 1990. Expenditures for the year 2000 are expected to be $185 billion, assuming implementation of current regulatory standards. Capital investment in environmental technologies increased 34 percent from 1987 to 1990. The $47 billion spent on environmental capital expenditures in 1990 was approximately 3 percent of all U.S. capital investment. Government agencies represent approximately one-third of domestic environmental expenditures. We were attracted to the industry for several reasons: it was a new industry with the opportunity to establish market leaders; there was tremendous regulatory and public support for an improved environment; and new technologies could easily improve the performance and cost issues faced by industry. Some of these factors are:

1. Increasing Regulatory and Public Pressures

We recognized that the principal driver for environmental technologies has been, and will continue to be, governmental regulations and enforcement. Public opinion also has become a potent corporate motivation. All indications are that regulations will become more stringent, and, with the new administration, enforcement is expected to be strengthened. Public pressure on companies to provide products and services in an environmentally sensitive manner will continue to increase. With heightened awareness of these forces, many of the nation's largest industrial concerns have established corporate-wide environmental and pollution prevention programs as good business practice. Voluntary and mandated environmental programs should also stimulate further demand for new technologies, both to clean up old operations and to prevent future waste streams and potential liabilities.

2. Growing Cost of Environmental Compliance

In addition to these factors, there is a growing awareness of the rapid increase in environmental compliance costs, at both the corporate and national level. The cost of regulation has affected the growth and competitiveness of several U.S. industries. With better waste tracking and cost accounting, these costs are more quantifiable, attracting and demanding senior management attention. If the Securities and Exchange Commission adopts a current proposal to force companies to estimate their future contingent environmental liabilities and to reflect those costs on their financial statements, demand for technologies that lower costs and potential liabilities will accelerate even more. The cost of compliance will continue to escalate as existing technologies approach their technical limits. Some standards already mandated cannot be achieved with today's technology. While facing increased costs for pollution prevention, businesses and government agencies also must deal with remediation of past pollution, which is expected to be the largest environmental market for the next decade. The DOE estimates clean up of its sites alone will cost $200-400 billion over the next ten to fifteen years. As illustrated in Figure 1, new technologies can cause a shift in the cost curve and provide reduced emissions at lower cost, whether the goal is pollution prevention or remediation.

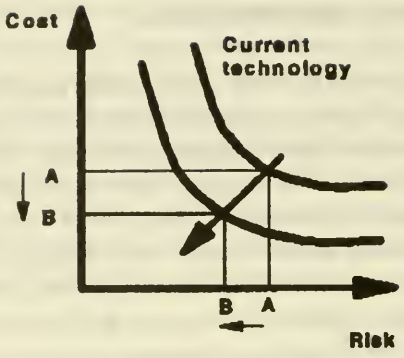

Figure 1.

Shifting the cost curve through a combination of improved technologies and pollution prevention measures is quite possible, and industry is starting to recognize the potential cost savings that pollution prevention and accelerated remediation can offer. One obstacle to the adoption of new technology is the fact that many companies cannot quantify their cost of compliance or the cost of pollution due to inadequate accounting treatment and information. As companies refine their accounting systems to add waste-related costs to the overall cost of goods, rather than general overhead, the benefits of pollution treatment and avoidance will become more apparent.

3. Increased Public - Private Cooperation

After years of adversarial relations, government and industry are beginning to recognize that they must cooperate to effectively meet their different goals. As the government is forced to comply with the same environmental regulations faced by the private sector, there has been increased resource and cost sharing between industry and government to meet environmental objectives. Today, one-third of current environmental spending is incurred by government agencies. In the area of basic research and development, the percentage is even

higher. In addition, the end of the Cold War has forced the federal government to examine the costs of cleaning up from the nation's weapons programs. The expected cost of remediating the environmental damage suffered at the national laboratories and weapons manufacturing facilities has led the government to increased cooperation with industry. Many now view this as an opportunity for the government to help establish a new industry and aid the competitiveness of U.S. industries.

4. Expanding U.S. Environmental Industry

Currently, most environmental-technology expenditures are viewed as a simple cost of compliance. As the environmental industry grows and the infrastructure becomes more established, this sector of the economy will encourage further growth and development. This emergence will increase customer confidence and acceptance, making it easier to develop and commercialize environmental technologies. The U.S. is the current leader in environmental technology development. However, given the current adverse relationships between the regulators and industry and the changing regulatory environment, it has been difficult for this industry segment to demonstrate significant commercial success and attract necessary capital and management. As government and industry recognize that economic growth and environmental protection need to be coordinated, the U.S. will be able to capitalize on its position and become the leading exporter of environmental technologies and solutions. This will increase the demand for technologies, and the opportunity for profitable commercialization will increase.

Our analysis has included active involvement as an investor, significant efforts working with regulators, talking to people who make purchasing decisions, meeting with technology sources, and leading the venture industry's dialogue on environmental investing. We found no investment model in the public or private sectors that we could emulate. What we found was a system that penalizes innovation and repels capital. In order for the private sector to devote its risk capital to the development and application of new environmental technologies, a path to commercialization must be forged whereby investors face a reasonable chance of financial reward for their investment risk. If prudently fostered, these innovative technologies may provide U.S. industry with a

competitive advantage and establish a profitable growth sector of the nation's economy. In other words; in order to have a viable commercial sector of the U.S. economy developing innovative environmental technologies; there must be an opportunity for the investor to generate economic profits; or else they will employ their capital elsewhere. Following are the major barriers we have found that inhibit rapid commercialization of environmental technologies for profit:

Lack of Information

The need for technologies to deal with critical environmental problems is not publicized widely by industry because of the negative publicity associated with having environmental remediation or clean-up needs. This is true even if the need results from new regulation and current operations are in compliance. Thus, it is difficult to gather accurate market information, and the more acute the problem is, the less likely that outsiders gain access to the information. Often, as in the case of processing and chemical industries, many of the technologies and products used are protected through trade secrets and proprietary processing methods, thus, making specific needs less accessible. Even through accounting, which simply aggregates all compliance costs, industrial companies may not be aware of their actual environmental costs. Candid corporate disclosures are also difficult due to fear of regulatory exposure. Unfortunately, as a result, many solutions remain sequestered from the marketplace inside the operations of the developer. Without adequate user information, investors often choose to invest in industries with more discernible needs and dependable markets.

Testing and Demonstration

Due to the severe penalties for non-compliance, users often will not allow unproved environmental technologies to be used on their premises. Current regulations do not allow industrial producers to test promising technologies without following an extensive and unpredictable permitting process and maintaining constant compliance with existing standards. Those testing innovative technologies are given no compliance relief for any kind of "best efforts" use. Such compliance and liability structures allow for little error, and, consequently, simulating "real world" conditions for the normal trial-and-error method of technology development is difficult. One researcher estimated two

years and several hundred thousand dollars can be required to obtain the necessary R&D permit, which purportedly allows for easier testing of new technologies. These costs are prohibitive for a new start-up and make many new technologies uneconomical when compared to permitted, but less effective technologies. In addition, the same regulatory barriers to internal testing of new products prevent a developer from providing pre-permitted technology to customers for "beta site" testing.

Uncertain Permitting Process

One of the greatest impediments facing new technologies is the uncertain permitting process. Nearly every investor in the environmental area has suffered losses due to the multi-year delays in obtaining permits necessary to commercialize the product. The regulatory maze is daunting and requires patience and perseverance. Often, it is not only the federal permit requirements that can destroy a company, but also the multiple state and local regulations that have effectively partitioned a national market into several hundred regional and local markets each with unique permitting requirements. Small companies are at a particular disadvantage in this process as they typically do not have the personnel, expertise, or capital base necessary to survive the process.

Early Stage Companies

One final obstacle to commercialization of new technologies is the desire of customers to buy a proven product from a known supplier. Customers want to know that the technology works, and they want suppliers to be well managed and dependable. Consequently, there is a reluctance to be the first user of a technology. This is a common obstacle for any new company, but it is especially difficult for environmental technologies where the cost of failure is so high.

Shortage of Risk Capital

Despite the size and potential returns of the environmental market, there is a shortage of capital to commercialize environmental technologies. As set forth in figure 2 below, a study by the Massachusetts Institute of Technology concluded that there is a great deal of capital available for scientific R&D and for

"permitted" and accepted technologies. However, very little capital is available for the crucial development, demonstration, and commercialization of new and innovative technologies. Venture capitalists have thus generally avoided large investments in environmental technologies. As a result, there is little competition to fund such investments and the potential for high returns, if these technologies are successfully commercialized, are increased.

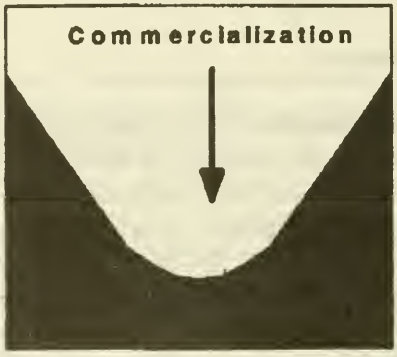

Figure 2.

Yet investing at an early stage in the development cycle provides the greatest opportunity to add value through broad selection, user input, technical assistance, and quality management. This active participation in turn enhances the opportunity for capital appreciation and success.

Unexploited Technology Sources

Most environmental technologies have been developed in-house by companies trying to solve specific pollution and remediation problems. Once solved, these companies continue with their business and have little interest or incentive to commercialize the technology they developed to meet their compliance needs. Most firms who have the technical sophistication and engineering know-how to develop leading environmental solutions tend not to be in the environmental industry and have little economic incentive to commercialize their inventions. Many of these technologies are already in use with permits and operating

histories and represent a large, untapped reservoir of profitable opportunities that has cost millions of dollars to develop. Given that most industrial organizations use similar technology to meet regulation which applies equally to all of industry, this technology source harbors a significant opportunity for the country. Similarly, much development occurs in the national laboratory system and universities where commercialization has not been the primary goal.

Establish a Predictable Investment Model

Unlike most investments, the value of environmental technologies is a clear function of market acceptability (often represented by a permit). When the customer is buying compliance, a product that does not meet compliance requirements has little value. The uncertain cost and length of the permitting process is one of the largest risks facing early stage environmental technology investing. As a result, the cost of investing before commercial acceptance is far less than after such acceptance. The all-or-nothing nature of the environmental technology market, and the absence of a successful investment model, lead to a discontinuous risk/value curve as shown in figure 3 below.

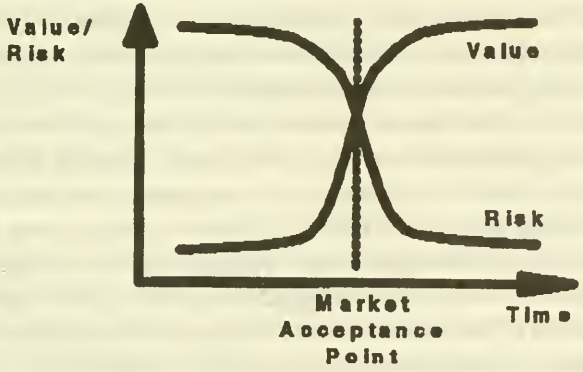

Figure 3.

Investors need to feel comfortable with certain basic criteria before they are willing to commit capital to an enterprise. Unfortunately, the environmental technology industry is so young that there are few success stories for investors to

emulate. In fact, the venture capital industry's experiences with early-stage environmental technologies has been generally negative, as the traditional venture capital model has been unable to overcome the unique obstacles of the environmental market. Without a precedent to follow, most investors have preferred to capitalize technologies in more traditional industrial sectors.

The National Environmental Technology Act of 1993

With regard to the National Environmental Technology Act of 1993, as proposed, I would reiterate that government can play a crucial role in the environmental technology industry, though it should not be in the role of selecting or supporting one technology over another. From the National Labs on down, government has not been effective or efficient in the development of commercial products. Customers and markets generally will dictate the ultimate technologies used. Therefore, what roles can the government play in encouraging the development of an environmental technology market and how well does the Bill address those roles?

First, the emphasis should be on commercialization—not development—of technologies. The largest, most efficient source of environmental technologies is private industry, which has hundreds of developed, proven technologies applicable to both government and other industrial users. However, these companies are not in the business of environmental technology. They make cars or computers or gasoline. Moreover, they are generally unwilling to license their developed environmental technologies to new companies for fear that, under the far-reaching liability provisions of CERCLA, if that new company uses the technology on a site, the developer of the technology, who has nothing to do with the application or site, could be dragged in as a PRP and held liable for clean-up costs on a site he has never visited nor been commercially involved with. Congress is in a position to clear such a licenser of liability in these cases, and the market could gain access to millions of dollars worth of developed technologies waiting for a commercial champion.

The overriding concern of liability is also the principal reason it is impossible to find private sites for the testing of new technologies. Current regulation give little latitude to private parties who want to try new technologies. There is no

allowance for error in a process that requires trial and error to successfully develop. Because of the government's ability to accept liability for federal sites, the Bill's proposal for federal test sites has a great deal of merit. It is important to remember however, that testing without resulting in permits means little. If I can't sell it after it is tested, commercialization will not happen. Permitting is primarily a state and local function, and they must be consulted and brought in early to assure that the testing protocols meet their requirements as well.

The lack of a national market is the single biggest impediment to commercialization. Private capital will not support products that cannot demonstrate significant commercial potential within a reasonable time. Because permitting is technology and site specific, it is very difficult to profitable sell environmental technologies. The federal government must take the lead in developing a national market. The Bill's provisions for a National Clearinghouse help disseminate and educate both industry and regulators, but more is needed. The EPA, perhaps in conjunction with the National Labs, must re-establish itself as a scientific organization with credibility. It can take the lead in testing new technologies and publishing the performance demonstrated in a neutral and unbiased fashion. Care must be taken with proprietary company information, but funding to establish such test centers would be well spent. Again, we would emphasize that not only must the tests be conducted in a fashion that proves a technology's efficacy and safety, but it must also produce data acceptable to the state and local permitting agencies as well as potential customers. Contrast our system of environmental permits with proven success of the FDA and medical technologies.

The proposal to modify federal procurement rules to encourage federal use of new technologies is a good idea. In many instances, we have found our portfolio companies could not qualify for government contracts because the procurement requirements focused on how a product was produced or specified a certain technology, rather than focusing on performance criteria. A subtle point is to be sure the procurement rules do not preclude a technology developer who tests and proves the efficacy of his technology at a federal site from bidding on selling that technology to that site at commercial rates after the test. Under current rules, competitors may argue that the developer has received an unfair advantage by virtue of the federal testing at the site.

Another area addressed by the proposed Bill is the need for a coordinated interagency policy. This would be a welcome relief as we have discovered that nearly every agency has some environmental technology development program underway. these often duplicate each other, or fail to take into account the various approvals needed from other agencies charged with oversight or enforcement. Industry would welcome a central source for answers to its environmental issues. Just as industry has spent millions on duplicative research and development because they were unwilling to air their dirty laundry, government appears to have fallen into the same trap. The National Environmental Technology Panel may be a good start.

Similarly, government can play a major role as educator and disseminator of up-to-date information. The National Clearinghouse concept is one we have supported. It is very difficult to obtain information on the market, user needs, and available technology alternatives. We are concerned that participation in such a clearinghouse must be voluntary. The Bill in Section 211(b)(2) empowers the Director to "monitor on a continuing basis the research and development being conducted on environmental technologies by private industry". There is no elaboration of how this monitoring is to be conducted. Many companies will not cooperate with monitoring of their critical research functions, nor should such reporting be mandated. It should be made clear that a huge data collection apparatus is not what is envisioned, and that participation is not mandated.

We would question the need for the creation of an Environmental Technology Advisory Council given the existence of the National Advisory Council on Environmental Policy and Technology. Perhaps NACEPT can be used in some fashion to meet the functions envisioned. We do support the interaction and multiple perspectives such boards bring to the analysis, and would suggest the make up of any board dealing with the development of a new industry should include some voice from private capital.

Finally, we should address the proposal's funding program. It is more critical to provide funding for testing facilities, adequate training of permit writers, and the purchase of innovative technologies than to provide funding for technology research. We would rather see purchase orders and national permits than

grants, because if a national market can be established where new companies commercializing effective technologies can thrive and where investors can see a demonstrable path to profitable investments, capital will flow to this area. Most importantly, private capital has been much more successful at identifying commercial needs and potential than government agencies. To the extent funding is to be made available, science and technical merit should take a back seat to commercial potential in the selection process. The National Labs are full of solutions looking for a problem or $1 million cures when the market needs a $10 medicine. By definition, an environmental technology company that is a commercial success has demonstrated market demand for its product, proven it to be a cost effective solution relative to alternatives, and meets the social criteria of providing jobs, tax revenues, and a cleaner environment.

With that said, start-up funding for new organizations trying to commercialize a viable technology is needed. There is little venture capital available for such ventures until they are quite far along in the commercialization process (generally, post-permit). To the extent, some of the investment risk faced by private capital in this sector can be mitigated with government cost sharing of the early risk, more capital will be available. It is important that the performance reviews envisioned in the Bill be enforced as, all too often, SBIR grant recipients have never quite made it out of the development stage. If it isn't being sold, it isn't commercial, and it won't be sold unless it's someone's livelihood.

Conclusion

The U.S. is the current leader in environmental technology. However, under the current regulatory framework, the technology-oriented environmental market will never be a successful domestic or international business segment for U.S. industry. Should we fail to find a domestic answer, foreign competitors will purchase our best environmental technologies and use them to build successful international product lines or companies. To illustrate the acute nature of this issue, from 1980 to 1991 U.S. ownership of remediation technologies used in the United States dropped from 64% to 31%; that means that in only eleven years over half of the U.S owned remediation technologies were sold to foreign countries due to a commercialization process, which scares away domestic risk

capital. Currently, over 70% of the air pollution control technologies employed are controlled by foreign firms and interests.

Technology Funding appreciates the opportunity to offer any insights we can to this process.

STATEMENT OF DR. ROBIN J. ROBINSON, EXECUTIVE VICE-PRESIDENT, CLEAN SITES

I. Introduction

Mr. Chairman and Members of the Committee, my name is Robin Robinson. I am the Executive Vice President of Clean Sites. We appreciate the opportunity to testify today on the need to promote innovative environmental technology.

Clean Sites was formed in 1984 by a group of industry and environmental leaders and former senior government officials as a non-profit institution dedicated to solving the nation's hazardous waste problems. Their goal was to establish a consensus-building organization to work with all interested "stakeholders" to improve and accelerate the hazardous waste cleanup process. With a Board of Directors comprised of representatives of business, academic, public service and environmental interests, Clean Sites' efforts to improve and accelerate the cleanup process are directed toward conducting policy analysis, providing technical project management services at sites, and mediating and allocating cleanup costs among potentially responsible parties (PRPs).

In this testimony I'll describe our involvement in innovative technology initiatives and why it is important to encourage development of better cleanup tools and systems. I'll then briefly outline some of the barriers to getting new technology tested and used.

II. Clean Sites' Involvement in Innovative Technology Initiatives

Clean Sites is currently working with EPA's Technology Innovation Office (TIO) to develop and facilitate public-private partnerships to evaluate innovative technologies for hazardous waste treatment at Federal facility sites. These partnerships focus on jointly funded technology evaluations at selected areas or units within Federal facilities. The partnerships are based on the concept of cost-, and information-sharing between government (EPA, Federal facilities, state and local environmental regulatory agencies) and industry (companies who bear responsibility for cleanup at many hazardous waste sites). The objective of the partnership is to obtain cost and performance data which are representative of "real-world" full-scale conditions. The private partners benefit directly by analyzing the data collected and using the results to understand how these technologies may work at their own sites. They gain this experience without the risk of "double jeopardy"; i.e., using innovative technology at their own sites where, if the new technology does not work, the PRPs would have to repeat the cleanup using conventional technology. The Federal facility benefits from the partnership by the additional information gained and by validating the technology for use at other Federal facilities.

The first Federal facility to participate in the partnership is the McClellan Air Force Base. We are investigating innovative insitu groundwater treatment technologies. These evaluations will collect the process, operation, cost, and performance data necessary to select and apply promising technologies at other hazardous waste sites. This information will be in the public domain. EPA will be responsible for disseminating information and facilitating the use of these technologies at other sites.

Our McClellan experience coupled with what we have learned on a first-hand basis at over 80 hazardous waste sites enable us to address barriers to the use of innovation in implementing cleanup efforts and several other problems of interest to this Committee.

III. Importance of Improving Technologies for Hazardous Waste Cleanups

While estimates of cost and timing are uncertain, the size of the hazardous waste remediation market is expected to reach between $200 billion and $750 billion in the next several decades. These funds will be spent in a variety of arenas—Superfund, RCRA corrective actions, underground storage tanks, Federal facilities—by EPA, DOD, DOE, states, and private parties.

Clearly, remediation costs using existing technologies are very high. Development and implementation of improved technologies offer PRPs, municipalities, and Federal agencies the possibility to resolve their liabilities in a more cost-effective manner. The money saved by using innovative technologies could be used to reinvest in industry, create new jobs, offer job training programs, expand small businesses, allow municipalities to provide needed services . . . in short, to better serve our nation's needs.

In addition, because cleanups are so costly, both industrial and governmental responsible parties often tend to delay cleanups rather than proceed with remedial actions. There is no doubt that if a "magic box" were developed that could process hazardous waste, making it clean for a penny a pound, the pace of cleanups would accelerate, and the nation's hazardous waste problem would disappear much more

quickly. Unfortunately, no such magic box exists; instead, the most commonly used technologies—burning and burying—are both expensive and inefficient. We as a nation need to develop "magic boxes" for hazardous waste remediation.

IV. Problems in Developing Improved Technologies for Hazardous Waste Cleanups

In order to provide some context for examining the issues of interest to the Committee, it is important at the outset to step back and consider some of the major barriers to trying new remediation technologies at hazardous waste sites.

A. Traditional Private Sector Market Incentives Have Not Worked To Promote the Use of Improved Technologies at Hazardous Waste Sites

It is often suggested that traditional (private sector) market forces will ultimately bring about increased use of innovative technologies at hazardous waste sites. In theory, the expense of established technologies, such as incineration, will stimulate research and development initiatives by PRPs and investors to create newer and cheaper ways of addressing contamination. As demand for these newer technologies increases, the costs of remediation will decrease. While a reasonable hypothesis, there are at least five differences between traditional markets and the "hazardous waste remediation market" which appear to have created barriers to development and implementation of innovative technologies.

1. *Market types are not uniform.* In contrast to traditional markets, say for automobiles, the market type is difficult to discern with respect to hazardous waste cleanup. Many sites can be classified based on the particular activity which led to the site becoming contaminated. For instance, sites can be grouped as municipal landfills, industrial landfills, mining sites, wood treating sites, etc. One could thus argue that we know the market types. However, while many sites may share certain common characteristics, there are a myriad of factors that must be accounted for when determining which technology to employ for remediation. These include: soil type, soil permeability, volume of wastes, toxicity of wastes, and chemical characteristics of both the waste itself and the media contaminated by the waste. When all these factors are evaluated together, it becomes apparent that each site has its own special characteristics, making it very difficult to ensure that a particular technology will work at every site of that type. Standards and requirements driving the need for improved technologies vary regionally, also adding to the unpredictable nature of the market.

2. *Technology selection is separated from technology development.* Another factor to consider is that in the traditional marketplace, the decision maker is the one who has something at stake, usually a large financial stake. For example, several automobile companies have expended a great deal of time and money on research and development of an electric car. Notwithstanding oil prices and Clean Air Act mandates, this was a decision made by the top management of these companies. If they are successful, the up-front investment of time and money (their "stake") will pay off handsomely.

For example, in the Superfund program, by contrast, the ultimate technology selectors—the decision makers—are many different EPA employees. In the cases where PRPs have the lead in conducting the remedial investigation and feasibility study, the PRPs may propose a remedial alternative. However, EPA, whose financial stake in the decision does not rise to the level of the stake of the PRPs, may accept or reject this proposal. Because (1) innovative technologies have often not been proven under field conditions or on a full-scale basis, (2) EPA is under pressure to achieve cleanup quickly, and (3) EPA is understandably reluctant to precipitate further controversy in a program riddled with controversy, the Agency is more likely to select an established technology, whether it be at an enforcement-lead or a Fund-lead site.

A technology certification program, such as is being considered by this Committee, could help lower this barrier by ensuring that approved new technologies would meet regulatory requirements.

3. *Penalties outweigh rewards for risk-taking.* Normally, the rewards one may expect must be commensurate with the risks taken. To use the earlier example, if an automobile manufacturer perfects the electric car, the company may reasonably expect to make a great deal of money. Conversely, failure may represent lost business opportunities but does not result in external penalties such as those often imposed by statutes such as Superfund or RCRA. These penalties include the risk of having to implement a second remedy using conventional technologies, stipulated penalties in Consent Decrees for failure to meet time schedules and performance objectives, potential secondary pollution problems

resulting from the technologies, cost overruns associated with a high level of uncertainty about the technology's performance characteristics, and revocation of treatment, storage or disposal permits. If an innovative technology is successfully used at a cleanup site, the reward to the PRPs may be a significant cost savings, which is analogous to the automobile manufacturer's profit in perfecting the electric car. To risk-averse PRPs, however, the penalty for failure can be a more powerful deterrent.

4. *Inventors/Investors are reluctant to charge ahead.* There is another entity with a large stake in the selection of a remedy besides the PRPs: the inventor of the particular technology at issue. If EPA and PRPs are reluctant to implement innovative technologies, the reward for risk taking becomes uncertain. In that case, venture capitalists and inventors may we turn their attention to more profitable areas.

V. Other issues

I would like to make a couple of other points that tie directly to the government's role in innovative technology development.

A. Lack of a National Research Strategy

At this point, the nation's hazardous waste programs lack a comprehensive national research strategy for facilitating innovation in remedial technologies. This lack of direction may be an additional deterrent to innovation. An interdepartmental Panel, such as this Committee is considering, could develop a government-wide environmental technology strategy that would encourage technology development by identifying critical needs and recommending actions to spur development and spreading of the technology.

1. *There is no "road map" for new technology development.* Although the Superfund Innovative Technology Evaluation (SITE) Program has been useful in offering developers of new technologies a mean's of having their inventions evaluated in an objective manner, significantly more can be done. Large-scale programs do not exist to provide sharing of information in the areas of research, development, demonstration, and commercialization of remedial technologies. In short, there isn't a vehicle or network for venture capitalists, vendors, inventors, PRPs, and Federal agencies to share information about promising developments. There is a need for a strengthened EPA program for demonstrating technologies at Federal sites and tying them into private sector efforts to develop such technologies. A technology clearinghouse could also be useful in this regard.

The McClellan project provides, on a small scale, a mechanism for the participating partners to share information regarding the operational, performance, and cost data associated with the technologies under evaluation at McClellan Air Force Base. The proposed National Environmental Technologies Institute which this Committee is considering may provide such a mechanism on a larger scale to provide similar information exchange among more parties with interests in hazardous waste cleanup technologies.

Such a large-scale effort could cover a larger number of technologies, a variety of different site conditions, and an assortment of operational conditions. Such a program could also provide the information needed to define the nature and extent of the technology needs and the resultant size, timing, and direction of the market for specific technologies.

B. Lastly, EPA can benefit from closer cooperation with the Departments of Defense and Energy in developing better site cleanup technologies.

The proposed National Environmental Technology Panel, which this Committee is considering, might enhance coordination between federal agencies towards development of new technologies.

We have found in our efforts to improve and accelerate hazardous waste cleanups that cooperation among the stakeholders is almost always beneficial. This applies to EPA, DOD, and DOE in their respective efforts to develop innovative technologies. Although these entities face certain problems unique to their missions, many contamination problems and contaminants are similar, and often technologies can be modified and made usable for a problem that may differ slightly from the problem for which the technology was originally designed. The nation as a whole would certainly benefit from a pooling of resources, both talent and money, that each agency or department houses.

I. Conclusion

The Committee's desire to address the issue of barriers to the use of innovative technologies is appropriate in light of the vast sums of money projected to be spent on cleanup of hazardous waste sites. By looking for ways to break down the real or perceived barriers, Congress may begin to work towards implementing a more cost-effective cleanup program, and may help improve the quality of our nation's hazardous waste cleanup technology further down the road leading to health, environmental and economic benefits.

Mr. Chairman, I appreciate having had the opportunity to testify before this Committee. I will be happy to answer any questions you or the other Members have.

STATEMENT OF BRUNO BRODFELD, VICE PRESIDENT, STONE & WEBSTER ENGINEERING CORPORATION

Mr. Chairman and Members of the Committee:

My name is Bruno Brodfeld and I am Vice President and Manager, Advanced Technologies of Stone & Webster Engineering Corporation, in Boston, Massachusetts.

I appreciate the opportunity to present testimony at this hearing which considers a bill to establish a set of programs to promote environmental technologies, and which is entitled "The National Environmental Technology Act of 1993". This bill addresses technology issues of great importance for the nation in a very comprehensive way. Since our company is very active in many areas related to environmental technologies, we are in a position to appreciate the far-reaching impact the proposed legislation would have.

I would like to briefly review the activities of our company, discuss the need for innovative environmental technologies, our perspective of the principal barriers inhibiting the application of these technologies and possible steps to remove such barriers, and then highlight our view of the impact of the proposed legislation.

Stone & Webster Engineering Corporation

Our company is a major Engineer-Constructor with broad experience in engineering, design and construction of government, industrial and institutional projects, including power generating facilities, refineries and petrochemical plants, industrial facilities, water resources and infrastructure work, transportation facilities and a wide range of civil works projects. One of the major areas of activity of the company is environmental work including site studies and permitting, waste minimization and treatment, waste disposal and storage facilities, air quality and air toxics programs, risk management and safety analysis, hazardous waste remediation, noise control, health and safety programs, and geotechnical studies. A common thread of many of these activities is the application of environmental technologies including some advanced technologies.

To emphasize the importance of environmental work in general, and of environmental technologies in particular, the company established a major division called Stone & Webster Environmental Technology & Services. One of the goals of this division is to foster the development, demonstration and commercialization of innovative environmental technologies. Our main approach in this area has been to stimulate joint activities with technology developers and to help initiate programs for technology demonstration with the participation of industry and government agencies, particularly in the field of hazardous waste remediation.

Need for Innovative Environmental Technologies

As a result of our society's increased awareness of the contamination levels at many sites in the country, and of the health risks associated with hazardous wastes in soils and particularly groundwater, there is also an acute realization of the need for technologies that would help to solve our problems. The emphasis is placed on both pollution control technologies to prevent or reduce further contamination, and on remediation technologies to clean up sites already contaminated.

Pollution control including waste management, waste minimization, product substitution and recycling is typically based on industry-specific and process-specific technology applications. It is directly related to the production processes in each industry and has now become an integral part of any new plant design. In addition, system modifications and new treatment loops are often retrofitted into existing facilities.

While regulatory driving forces have already had an impact on the promotion of environment-friendly production processes, in some cases there is a need for eco-

nomic incentives as well. This could include creating opportunities for development and demonstration of pollution control technologies which some companies, particularly small businesses, would be slower in adopting without some programmatic assistance from the government. This may include testing and evaluation of technologies and assistance in identifying control options. The proposed legislation creates a framework for achieving these objectives.

By far the greatest environmental challenge facing the country is that of the cleanup of contaminated sites. The magnitude of the problem is highlighted by the level of current and projected expenditures for cleanup under Superfund and Resource Conservation Recovery Act (RCRA) legislation, and under other Federal and state regulatory requirements. Expenditures of several hundred billions of dollars are projected for the next 30 years in the U.S. for the cleanup of sites contaminated with hazardous wastes. Some large companies are spending at this time in the order of $50 to 100 million each for the remediation of their contaminated sites. A major part of the effort required for achieving the cleanup goals is related to developing and testing remediation technologies.

A unique feature of the technology remediation area is that the government and the private sector are faced with very similar challenges at their respective sites, and therefore have a common interest in developing, demonstrating and applying technologies that can do the job in a cost-effective manner. Even DOE sites which are contaminated in part with radioactive wastes are also typically contaminated with hazardous wastes similar to those found at industrial sites. Also, contamination conditions at most DOD sites are analogous to those prevailing at many private sector sites.

Based on this clear common need of government and industry for cost-effective remediation technologies, our company has made a determined effort in the last two years to contribute to a national approach, with government and the private sector cooperating as users of technology. Our company has had extensive experience over the years with joint industry efforts in technology demonstrations with participation of multiple industrial users whenever a common interest existed for the development of new technologies. Therefore, it has seemed logical to us that joint efforts of government and industry as users of technology are similarly possible and desirable in the area of environmental restoration in view of their common interest for an accelerated development of innovative remedial technologies. We have expressed this view persistently in meetings with many private sector companies and with several Federal agencies including EPA, DOE, and DOD. Our initiative has paralleled the active consideration of possible options within these agencies and some major private sector companies seeking ways to bring together the resources and capabilities of the government and private sector for the common good.

Recently, we have been pleased to see the establishment of a public/private partnership for the purpose of demonstrating and evaluating innovative remedial technologies at McClellan Air Force Base. Our company is currently assisting Clean Sites, Inc. in the technical facilitation of this public/private partnership and we are proud to be able to contribute to the constructive dialogue on key technical issues of common interest among the participants, which include several Federal and state agencies and seven private sector companies. We believe strongly that this type of joint efforts of government and private sector technology users together with Federal and state regulators represents an excellent example of constructive cooperation which we would like to see replicated as many times as possible.

Barriers Inhibiting the Application of Innovative Technologies

One of the realities of today's environmental market is that, for one thing considerable efforts are undertaken in both government and private sector for the research and development of innovative remediation technologies, and for another the rate of penetration of those innovative technologies in actual projects and field applications is generally slow and somewhat disappointing. The driving force for developing new technologies is the widespread recognition that some established technologies are not adequate for site cleanup, and many others are not cost-effective. The national laboratories, many technology developers in the private sector, and various research organizations and universities have been involved in a wide range of research and development activities but, more often than not, the products of their efforts have not been readily accepted by potential technology users and regulators.

Our company's perspective of the barriers inhibiting the application of innovative technologies is largely the result of a study performed under a contract with the Colorado Center for Environmental Management and funded by the U.S. Department of Energy. The study was specifically aimed at assessing barriers to new technologies and recommending mechanisms that can contribute to the removal of those

barriers. As part of that program we have had meetings and discussion with a wide range of stakeholders to get their views on the inhibiting impact of regulatory and institutional issues, and their reaction to possible mechanisms for facilitating technology transfer.

The stakeholders with whom such meetings were held included Federal and state agencies, several private sector technology developers, a national laboratory, and several industrial users of technology. The main conclusions reached from the analysis of the information obtained can be summarized as follows:

—The use of innovative remediation technologies is primarily inhibited by the lack of reliable information on the performance, cost and regulatory aspects of these technologies. This uncertainty and lack of confidence appears to be the root cause of the reluctance of users and regulators alike to assume potential additional risks and liabilities, and it can be traced to the inadequacy of many technology demonstration programs.

—The attitude of state regulators is often another basic cause of the slow acceptance of innovative remediation technologies. Their reluctance to approve the application of innovative technologies, and the variations among attitudes of regulators in different states are sometimes due to a lack of exposure to up-to-date technology-related information, and a lack of systematic information-sharing with regulators in other states.

—No institutional system is currently in place which would protect the technology users from the risks associated with possible delays and additional costs related to the application of an innovative technology which fails to meet the anticipated performance levels.

A number of additional regulatory and institutional barriers were identified as part of the study but most of them can be overcome through an increased awareness of the issues and persistent efforts. The three main barriers mentioned above require a different programmatic approach for technology demonstrations, which we believe can go a long way towards removing some of the important barriers to innovative technologies and give a major impetus to the environmental technology market.

Specifically, in our view, demonstration programs for innovative technologies should meet the following requirements:

—The demonstration programs should be undertaken at Federal sites with the active participation of potential technology users from industry. Their role would include providing inputs, program reviews, test result assessments, and technology evaluations. Regulators from states where the demonstrated technologies are likely to be used in the future would benefit from participating in the program, and their subsequent acceptance of these technologies would be facilitated.

—Liability limitations should be instituted for a number of designated demonstration sites to encourage a broader participation in demonstration programs. Without compromising the need to protect public health, a way should be sought to decouple the demonstration goals from the rigid cleanup schedules at those designated sites.

—Provisions should be made for technology demonstrations at multiple sites whenever a technology is highly dependent on site characteristics such as hydrogeology or type of soil. An integrated program based on demonstrations at several sites can best define the advantages and limitations of a new technology.

—Technology demonstrations should be at full-size and include all the support systems which are typically required in project applications so that test results are as realistic and reliable as possible.

We believe that expanded demonstration programs which would include potential technology users from both industry and government as well as regulators would represent a significant step in establishing the credibility of performance and cost information of the demonstrated technologies, and would make a major contribution to an accelerated technology transfer.

Realistically, it must be stated that at this time there is no institutional mechanism that would encourage such an active participation of industry representatives and other stakeholders in technology demonstration programs at Federal sites. In our view, such an institutional mechanism is sorely needed, and we believe that the proposed legislation creates the necessary framework for it.

Technology Evaluations

Another important aspect of technology transfer is the need to evaluate the actual performance and cost of remedial technologies based on their longer-term application at a wide range of sites. Based on our experience with both government and private sector sites, we have found that at this time there is no systematic record available of how the various remedial technologies applied at contaminated sites have actually performed and what lessons can be learned from their application at sites with different hydrogeologic and contamination conditions. The absence of such a systematic record based on detailed evaluations at several sites, currently has a negative impact on the decision making process of site managers and tends to favor the selection of well established remedial technologies, for which more information is available, rather than of newer technologies which have only been applied at a few sites.

Impact of Proposed Legislation

In our view, the bill includes a number of provisions which will have a significant positive impact and give a needed stimulus to the environmental technology market. It will create constructive mechanisms for solving many of the challenging problems highlighted in this testimony. In particular, we believe that the proposed legislation will create a framework for joint government/private sector efforts in technology, stimulate the development of pollution control technologies, encourage expanded technology demonstration programs, and establish needed technology evaluation programs. Specifically, Title III of the bill emphasizes the importance of demonstration and testing of advanced environmental technologies for their successful commercialization, and Subtitle A encourages cooperative agreements between Federal agencies for the provision of assistance to business concerns conducting approved projects. We view the mechanism for phased funding of such programs as an effective vehicle for stimulating joint government/private sector efforts.

As indicated in the bill, the Director of the proposed national Environmental Technologies Institute, will promulgate guidelines for technology-related activities. We hope that private sector inputs will be sought for the development of the guidelines to ensure that their practical impact is maximized. We also believe the anticipated guidelines, and possibly the bill itself, should be more specific with respect to the establishment of private/public partnerships focusing on technology demonstration programs undertaken at DOE and DOD sites. The wide range of technology development and demonstration activities related to those sites can make a major contribution to the application of many innovative hazardous waste remediation technologies at industry sites.

We support the emphasis placed in the bill on the need for a national environmental technology strategy which, among other things, will recommend effective public and private partnership arrangements for the development of environmental technology, and administrative actions to remove barriers and to create incentives for the development and diffusion of environmental technology. The establishment of an Industry and Academia Advisory Council, as proposed in the bill, would represent a very significant step for ensuring a vehicle for timely reviews and recommendations by industry regarding policy, funding arrangements and applicable guidelines.

The proposed legislation takes an important step towards establishing systematic technology evaluation programs. Under Title IV - Additional Programs, and more specifically under Subtitle A - Continuous Improvement in Environmental Technologies, the bill establishes a program to evaluate, update, verify and disseminate performance and cost information on a wide range of environmental technologies. The establishment of the Environmental Technology Clearinghouse would represent an essential step in the dissemination of the information gathered through the program. Here again we suggest that remedial technology evaluation programs should be all-encompassing, covering private sector sites under Superfund or RCRA legislation, as well as Federal sites including DOE and DOD sites.

Conclusion

We support the bill and believe it can have a far-reaching positive impact on the development, demonstration and commercialization of innovative environmental technologies in our country. We are looking forward to comprehensive guidelines for the implementation of the various provisions of the bill and would like to emphasize that industry could make constructive contributions to the development of the guidelines.

STATEMENT OF THE NATIONAL ASSOCIATION OF METAL FINISHERS

INTRODUCTION

The National Association of Metal Finishers (NAMF) represents the interests of over 800 member companies in the Surface Finishing industry. NAMF members provide electroplating and other surface finishing techniques for a variety of industries including, medical, automotive, aerospace, defense and general industry. Surface finishing is accomplished as a service performed on customer owned parts, "jobshops", and in "captive shops", surface finishing operations integrated within larger manufacturing operations. Either way, these operations impart an array of characteristics to finished parts, industrial components and products. Primary characteristics are corrosion and wear resistance. Without this protection, our society would find it necessary to replace items such as automobiles, other consumer and industrial goods with much more frequency. This fact results in an intrinsic environmental benefit to society provided by the activities of the Surface Finishing industry. Industry processes reduce the need for basic metals and other resources through increased product longevity.

NAMF appreciates the opportunity to submit this testimony on behalf of its primarily small business members regarding the "National Environmental Technology Act of 1993". The Association commends the sponsors for the repeated references to small business considerations and strategies found through out the bill. NAMF brings the perspective of environmental technology users to discussion of the provisions of this initiative. Our members are, as stated above, small to intermediate sized industrial businesses which are highly regulated under the Clean Water Act, the Resource Conservation & Recovery Act, Clean Air Act, Emergency Planning & Community Right-to-Know Act, etc. This industry sector and others have first hand knowledge of the explosive increase in complexity and cost of environmental compliance. This has led the Surface Finishing industry to search for technology, pollution prevention and organizational solutions. Thus NAMF members and others like them represent the absolutely essential domestic market for environmental technologies.

NAMF has served over the past two years on several significant advisory committees within EPA. NAMF was the small industrial sector representative on the National Advisory Council For Environmental Policy and Technology (NACEPT) focus group which produced a study entitled "Improving Technology Diffusion For Environmental Protection". This focus group and report concentrated on the barriers within EPA, statute and the regulatory process to diffusion, deployment and commercialization of environmental technologies. The Association also currently serves on the EPA Office of Water's "Effluent Guidelines Task Force" which also has an information and technology focus. The task force is examining the information inputs including current and emerging technologies used in the effluent guidelines development process. The association has provided small industrial facility input in each of these forums. NAMF has also provided extensive input to the Congress on pollution prevention policy.

NAMF is pleased to provide the following comments and observations after brief review of S. 978.

S. 978—National Technology Panel—Strategy

NAMF supports the basic intent of the legislation which seeks to consolidate existing federal government environmental technology efforts within one entity. It makes sense to consolidate all the on-going activities of the government in one coordinated effort. The association suggests however that this consolidation of effort should allow the proposed National Environment Technology Panel to make specific recommendations to achieve expenditure cuts through consolidation and elimination of any current duplications of efforts. These savings might be used to off-set the increases in appropriations called for in the proposed "revolving fund".

Based on the extensive recommendations made by the NACEPT committee noted above, NAMF suggests that the Congress should raise the importance and stress the components of the National Technology Strategy developed by the Panel which address "regulatory and other barriers to development . . . of environmental technology". Many of the appropriate recommendations in this regard have been already identified, a mechanism for implementation is needed.

NAMF and the Surface Finishing industry have some initial doubts as to whether the Panel will be sufficiently informed or agile enough to make decisions regarding "gaps" or opportunities in environmental technologies. Environmental progress has been steady and incremental in our industry and others. Improvements have resulted from continual engineering progress in pollution control and prevention based on

longstanding customer vender relationships. Replication of this close commercial relationship within the Panel, even with the input of the proposed "Environmental Technology Advisory Council" will be difficult. In addition, every effort should be made in this bill to maintain and foster these traditional relationships which have an effective track record of producing countless technology and production advances.

New Methods For Information Distribution and Deployment of Environmental Technologies Are Needed

The concern about the ability of the "Panel" to identify the "critical technologies", however, does not necessarily indicate that small regulated industrial sectors such as Surface Finishing are not looking for a "new improved model" or method for the rapid, cost effective deployment and use of innovative technologies. This industry's current National Technology Assessment of Pollution Control and Prevention Technologies, undertaken in partnership with the National Center For Manufacturing Sciences is a example. This precedent setting Surface Finishing industry initiated assessment of current and emerging technologies will assist industry members make environmental technology choices outside traditional channels, using objective cost and experience data. NCMS is in fact partially federally funded. S. 978 should address the fact that small business technology users (the market) will need to marshal collective action through existing pollution prevention institutes, trade association foundations, etc in order to take advantage of proposed technology funding opportunities.

The increasing complexity of compliance has reinforced this industry's realization that new technology development and deployment models are needed, however, in existing regulated industrial sectors (again the largest market), these models and the technology that's needed must be finely focussed, change the regulatory environment and accommodate the fact that most environmental progress in industry is not made in leaps but in increments.

National Environmental Technologies Institute—Funding & Clearinghouse

If the funding activities of the "Institute" result in expedited, cost effective commercialization of environmental technologies, it will be supported by the technology user segment of the Surface Finishing industry. The Committee should consider however, whether the combination of required proportional return of development funding and the potential for disclosure of proprietary information in the "Clearinghouse" will result in high quality proposal submissions to the "Institute". Proprietary information disclosure will simply have to be fail safe and the requirements understood unequivocally by all parties if the funding provisions of the institute are to be effectively utilized. Firms engaged in development of on-going improvements in environmental technologies may view Institute funding as a final stop, perhaps for their highest risk endeavors.

If these issues are resolved, this funding might be particularly attractive to small, start-up firms willing to "split" the returns with the federal government and who seek whatever imprimatur of legitimacy that federal co-funding might provide through listing in the Clearinghouse, etc. NAMF's positive experience with the Small Business Innovative Research program and the now defunct Pollution Prevention Research program are potential models.

Innovative Technology Testing & Verification of Environmental Technologies

NAMF supports the intent of both these provisions which seek to provide locations and methods for both technology users (the market) and regulators to "verify" the effectiveness of environmental technologies. There could be at a very significant benefit. Permit writers and regulatory agencies would be more willing to accept innovation uses of these technologies by regulated facilities and in addition technology developers might be more willing to invest if "verification" resulted in acceptance by the regulators and industry, hence expedited commercialization and deployment.

Two concerns arise. Most importantly, user industries would need assurances that "verification" of technologies would not accelerate the current phenomenon of constantly moving "environmental goal posts". The verification procedure should be explicitly prohibited from resulting in changes in performance standards either by driving or modifying established procedures or, de facto, through implementation in state regulatory programs that can exceed federal standards. Therefore two elements for "verification" need to have significantly more statutory emphasis in the provisions requiring promulgation of "Guidelines" for verification. The language, "compliance with any applicable regulation at a lower cost than the estimated cost of the technology used to establish the applicable regulation" must be made categor-

ical. Second that verified technologies will only be used only to impart "flexibility" in meeting established performance standards. These assurances would not preclude changes to regulatory standards such as categorical effluent guidelines, Clean Air Act MACT standards, RCRA BDAT requirements based on their current time tables and analysis regimes which include economic analysis, penetration of technologies in industrial sectors, national capacities etc.

Conclusion

NAMF again appreciates the opportunity to testify on this legislation. We would again note that existing industrial sectors using environmental control and pollution prevention technologies and remediation sites will be the largest market for innovative technologies. This bill and others should keep the needs of the "market" firmly in view. The largest incentive for use of innovative technologies in this market will be regulatory reform, flexibility and pollution prevention emphasis for environmental progress.

Please know that given the quick response necessary to prepare these comments, some important elements have not been discussed here. Any other questions or issues can be explored further in additional comments as appropriate.

STATEMENT OF WILLIAM A. WALLACE, VICE PRESIDENT, CH2M HILL

Mr. Chairman and Members of the Committee, my name is William A. Wallace and I am the Director of Strategic Planning for CH2M HILL. In this capacity, I have a broad view of all technical disciplines and markets in which the firm engages. In addition, for the past eleven years, I directed the Hazardous Waste engineering group for CH2M HILL. The work of this group involves more than 1,000 employees located throughout the United States, who work on various aspects of hazardous waste management including site remediation and the application of traditional and innovative technologies for contamination problems. In the role of Hazardous Waste Director, I served, and continue to serve, on a number of committees involving hazardous waste technology. These include the Waste Management Education & Research Consortium, Hazardous Waste Action Coalition, Western Region Hazardous Substance Research Center, WASTECH, University of Wyoming Environmental Simulation Facility, Department of Energy's Environmental Molecular Support Laboratory and the Western Governor's Association Ad Hoc General Criteria Group for developing on site innovative technologies.

I would also like to introduce you to our firm. CH2M HILL, INC. is a consulting engineering firm providing water, environmental, transportation and infrastructure services in the United States. It is one of a family of five companies with 5,000 employees serving clients worldwide. The organization of CH2M HILL COMPANIES, LTD. addresses its clients' needs through project development, design, construction management and operation services. The companies of CH2M HILL are privately-held: owned entirely by the employees. The clients of the domestic engineering firm, CH2M HILL, INC., represent local, state, regional and federal jurisdictions as well as businesses of all sizes. At present, CH2M HILL, INC. is a major contractor to the U.S. Environmental Protection Agency in the Superfund Program.

To begin, I would like to congratulate this Committee on its foresight in proposing the National Environmental Technology Act of 1993. I heartily agree with the Committee in its findings that a "lack of a credible verified source of up-to-date information and operating data on environmental technologies impedes the development and use of new or updated environmental technologies that may be more efficient or cost effective . . ." I, and other members of the engineering consulting community, have been speaking out for nearly ten years on issues of inadequate environmental technologies to sufficiently characterize sites, determine the risks that are posed, and clean the sites to an exacting level of public, political and legal expectations. Our existing technologies are simply deficient in these areas.

In 1984, CH2M HILL recognized this problem and proposed the creation of a hazardous waste technology test and evaluation (T&E) facility. The purpose of this facility was to provide a location and an infrastructure to rigorously test pilot our full-scale hazardous waste related technologies under controlled conditions, and to transfer the results to the scientific and engineering community. At our own expense, we prepared a conceptual design of the facility and presented it to EPA and several members of Congress. The result was EPA's SITE program, a program which has similar intentions, but does not incorporate the infrastructure or the rigor needed for credibility.

Copies of our 1984 engineering report, "Hazardous Waste Control Technology Evaluation Center: Conceptual Design Study," can be made available to the Committee.

The National Environmental Technology Act which we are discussing today, is a great stride forward in breaking the stalemate that has impeded our collective progress in the protection of public health and the environment. With a structure and system in place that allows us to sufficiently develop, and rigorously test, new and existing technologies, we can begin to explicitly define the limits as well as the potential of these technologies. We will be better able to understand the critical parameters of performance that are necessary to design and use technologies under site-specific conditions, that is, what are all the important operating conditions that affect the performance of the technologies to be applied. At present, critical parameters for each technology have not been methodically identified. Further, the performance of most hazardous waste technologies for the range of probable values of critical parameters has not been systematically addressed. Given the absence of such important information, it is not surprising that the progress of hazardous waste remediation has not met our expectations. It is my belief that the legislation you are proposing can provide a meaningful and systematic approach toward rectifying the naive assumptions of the past, and give promise for efficacy of our environmental protection endeavors in the future.

Framework for Technology Development

I would like to briefly comment now on the constraints to action in environmental protection, as seen from the perspective of an engineer. As I do so, please keep in mind that, in simple terms, engineers are primarily *appliers* of environmental technologies, rather than *developers* or *users* (although roles can certainly be changed in individual cases). As a whole, engineers have the moral, ethical and legal responsibility to apply technologies and knowledge in a safe and economical manner to construct public works, create new products or processes, and solve dilemmas created by man and Nature. Engineers fulfill this role by performing work that conforms to established technical standards, complies with applicable laws and regulations, and meets client objectives. It should be noted that all engineering and scientific disciplines are grounded in a foundation of accumulated experience. New designs and techniques may vary, but they are essentially drawn from previous experience and applied to the project at hand. Uncertainties continue to exist in each project, but can be managed by applying accepted techniques of investigation, study, design, then action.

The conventional paradigm of engineering has worked well in the environmental protection programs for air and water. The goals of cleanup are well-established, and formulated by the federal government as "end of pipe" targets. These targets are defined as being either concentration- or technology-based solutions. With boundaries clearly drawn and goals uniformly established, engineers and scientists work toward the targets to produce increasingly cost-effective solutions to the pollution problems.

This is not the case in the hazardous waste arena. Among the primary differences that constrain waste remediation programs are 1) Inability to distinguish what constitutes a hazardous waste site [no minimal definition of what might and might not be a problem]; 2) Inability to accurately assess risk and subsequently determine what constitutes "acceptable" risk; and 3) Lack of defined targets [what level of cleanup is required, and how do we know we've reached it?]. The result is the stagnation of waste remediation programs, caught in seemingly endless investigations intended to fully characterize the nature and extent of contamination, or blocked by unanticipated conditions encountered during remedial action.

In large part, our current problems are derived from a woefully inaccurate risk assessment process, which relies on underdeveloped technologies to produce estimates of risk and acceptable risk that are defensible in courts of law. Given the high stakes involved in the decision of what constitutes acceptable risk, and the enormous liabilities that can and do emerge if something goes wrong, the precision and accuracy requirements for this decision are very high. The seemingly best option again is to continue to study the site in attempts to fully characterize all conditions in an essentially chaotic medium (the highly uncertain subsurface environment). Similarly, the boundaries of hazardous waste remediation methodologies have not been defined. We do not have a good idea about how much investigation is required to understand the site to a sufficient degree, how reliable the remedial systems need to be, nor how to test these systems, and what kinds of tests are appropriate to determine that remediation is complete.

In this framework, the role of government is to set the critical standards of performance that protect the public health and welfare. These standards provide targets and set the boundary conditions by which engineers can then work. Once established, the engineers will be expected to apply sound principles of science and engineering to achieve the performance target(s), while staying within the prescribed operating boundaries. The engineering challenge is to find the most efficient and cost effective path through this generally bounded territory.

Mature areas of engineering practice have well-defined and tested pathways, drawn from extensive experience born of trial and error. New areas of engineering, such as hazardous waste remediation, do not. You may consider that engineers have been building bridges for thousands of years, but only designing remedial solutions for little more than a decade. The body of experience, and technologies to accomplish the new tasks, are in infancy.

The need for solutions to hazardous waste contamination is apparent, although the method of determining what constitutes a hazardous waste site remains to be defined. As government begins to establish clear targets and the boundaries by which to remediate these sites, practitioners (including engineers) will experiment with many different pathways to reach the prescribed goal/solution. As they do so, they build a new foundation of experience from which to improve techniques and methodologies. Eventually, these pathways converge to a successful set (usually more than one) of procedures, methods and technologies that is generally shared by the practitioners. These areas of practice, new or mature, attract new technologies that offer more efficient or effective solutions. But before being incorporated into the practice, any new technology must undergo some level of scrutiny consistent with the established standards and the consequences of failure to perform during application.

The Origins of the Hazardous Waste Problem

Why haven't we taken the time to develop and test hazardous waste technologies? To answer this question, we need to go back and explore the origins of hazardous waste problems and the resulting legislation. When Congress passed RCRA in 1976, the prevailing concern was over hazardous waste problems confined to the currently generated hazardous waste stream. RCRA was seen as preventive. Hazardous waste streams would be sent to permitted facilities that could contain and could treat the contaminated waste.

Then the prevailing belief was that we had caught on to this problem early enough to prevent wide-spread contamination of the land and water. Further, hazardous waste streams could be managed using currently-available technologies, principally derived from the chemical process industries.

As EPA began to write the RCRA regulations, they discovered a whole new class of problems. In fact, they had not caught the hazardous waste problem early enough as they had previously believed. Sites such as Love Canal, Valley of the Drums and others suggested that wastes had already been disposed of improperly and in large quantities. Further, these sites had caused significant contamination to the land and water, and had also caused unacceptable risk to human health and the environment.

Congress acted quickly by passing a new law called the Comprehensive Environmental Response Compensation and Liability Act (better known as Superfund). The intent of this law was to provide the enforcement powers and funding to identify and cleanup hazardous waste sites that pose the highest threats to human health and environment.

But at the time it was enacted, *we never recognized that the Superfund problems were vastly different from the hazardous waste management problems covered by RCRA.* Whereas RCRA was designed to handle known waste streams of identifiable quantities and compositions, Superfund was set up to fix problems that were caused by past practices. Most of these problems involve waste of largely unknown quantities and compositions deposited above and below the ground. Contaminants from these deposits can spread into the environment through a myriad of pathways. Despite these basic differences, we still continue to assume that we have the technologies available both to accurately assess the levels of risk associated with hazardous contaminants and to implement remedial schemes to reduce that risk to acceptable levels.

Today we are still locked in to this hazardous waste remediation paradigm. We are still assuming that technology is readily available and all we need to do is find someone with enough gumption to apply it. However, in this highly litigious envi-

ronment created by Superfund, the problems with technologies are obscured. The current Superfund program uses litigation as a primary means to accomplish hazardous waste remediation. As a result, science and engineering have become tools of the litigators instead of a means of inquiry. Legitimate scientific and engineering questions about the nature of the remediation problem and the available technology for solving it have been submerged. Manifestations of this submergence include:

- Long extensive site investigations that yield inconclusive results and delay remedial action.
- Protracted arguments among the stakeholders about the efficacy of the remedial technology and the target level of cleanup.
- Massive implementation budget overruns. For example, at the MOTCO Superfund site, the responsible parties and the contractor are in dispute over budget overruns that now are more than three times the contracted amount. Here the contractor has publicly claimed that the site conditions he discovered during implementation were "100% different" from what he was given to believe based on the early documents.

We continue to rely on assessment and remedial technologies to resolve these issues, but we have never taken the time nor offered the resources to develop the technology to make it good enough to do so.

Further, in forming a litigation-directed Superfund program, Congress could not have created a worse environment for technological innovation! It is particularly ironic that a program that publicly and legally insists on the use of innovative technologies has created a legal and technical environment that is inherently hostile to risk taking. To these ends, we strongly support Section 331(d) of the bill which limits the liability of those engaged in testing environmental technologies.

The Current Status of Hazardous Waste Site Remediation

We know how to solve the "easy" problems. With RCRA we have relatively good regulatory control over currently-generated waste streams. With Superfund, we have taken care of a number of the most immediately-known threats to public health and environment. We also know how to clean up most of the surface contamination and the simpler subsurface contamination at sites. However, we are left with some very complex problems, which can be grouped into five classes:

- Sites containing large quantities of hazardous waste that have been released into complex geologies.
- Sites containing large quantities of hazardous waste that are precariously contained.
- Sites thought to have been cleaned up, but which still hold significant quantities of contaminants that remain undetected because of limitations of current technology.
- Sites at which remediation was attempted but the attempt only made the problem worse because of a lack of understanding of the true nature of the problem.
- Hazardous waste sites that are yet to be discovered.

What remains therefore is an extraordinary set of problems, most of which cannot be solved with current technologies in a way that will meet public, regulatory and legal expectations.

Recommendations

The following are my recommendations on what is needed to build the necessary infrastructure to develop new environmental technology.

1. *Establish the structure in which to develop new environmental technologies.*

Government agencies need to establish the targets and the boundaries within which the engineers and scientists should work in developing environmental technology. This will give the scientific and engineering community the needed guideposts about which they need to work. Some of these guideposts would include the following:

- *Testing Protocols.* Protocols for establishing the performance of environmental technologies is an essential part of this structure. Currently there is no set of procedures in common industry use for testing technologies to verify their performance. The absence of such procedures means that the reported testing results have limited value because their quality is not known.
- *Reliability.* The reliability requirements for environmental technology needs to be defined. I submit that hazardous waste remedial technology reliability is probably much greater than other areas of engineering, as this work involves the protection of public health and environment. The practitioners must under-

stand how well systems need to be performed and how far to push the performance envelope on any particular set of technologies.

- *Permanence.* The National Contingency Plan requires that remedies for Superfund sites be judged by their degree of permanence, but permanence has never been defined in engineering terms. Testing protocols need to measure and report on the degree of permanence which results from the application of remedial technologies being tested.

2. *Develop a process for systematically acquiring and transferring knowledge about the performance of technologies.*

I contend that we are still operating in the paradigm that suggests that technology is pretty much available, and the feeling I get is that our engineering community is seen as an impediment to progress. As I stated previously, however, our role is one of providing a safe, cost effective application of technology for the public good. In this role we have a number of questions we must ask of the technology before we believe it's ready to apply.

When we evaluate a technology where we're asked to employ at hazardous waste sites, this is what we want to know:

a. *What are the critical operating parameters?* In other words, what factors will affect the performance of the technology. An example might be heat content (BTU value) that affects the performance of a thermal destruction technology, or contaminant concentration levels that affect the performance of a soil vapor extraction technology.

b. *What are the values of those critical parameters at the site?* If we are going to use this technology, we'd certainly like to know if it can perform reliably and effectively across the range of operating conditions (critical parameters) found at the site.

In a fully-developed engineering practice, engineers expect to know the values of those critical parameters at all places at the site so we can design a process or structure to anticipate the differences in values, and adjust our approach accordingly. Unfortunately, for the more complex sites that dominate the Superfund National Priorities List, the subsurface conditions are extremely complex. Our current detection technology is poor and except for simple sites, cannot provide full characterization. In fact, it is useful to think about hazardous waste remediation problems as three types of problems based on site complexity.

- *Simple.* At one extreme are sites for which problems are well understood, where we can exercise reasonable control of the operating conditions during remediation. Asbestos removal, surface contamination and shallow subsurface contamination problems fall into this category. These problems can be handled using existing technologies because we can estimate very well the values of critical parameters of these technologies throughout the site.
- *Moderately Complex.* Moving further toward increasing complexity, we reach sites for which we can identify and deduce the range of values of the critical parameters that may affect the candidate technologies. These sites include most subsurface contaminated sites. But because of the limitations of our assessment and detection technologies, we cannot estimate prior to remediation what values of the critical parameters we will face and when. However, the nature of these problems allows us to anticipate changes in the operating conditions and incorporate preplanned actions when new conditions (change in critical parameter values) are uncovered. This approach is derived from the geotechnical engineering field (the Observational Method) and is a safe and practical way of handling these parameter uncertainties.

For the last five years, we have developed and presented this method to industry, government agencies and the congress. Today, I am happy to say that it is slowly emerging as the remedial method of choice for DOE, some of the DOD services, the engineering consulting community and several large companies.

- *Highly Complex.* At the other extreme are sites which are so complex that we do not yet understand the problem or cannot anticipate or control the operating conditions under which the remedial technologies must operate. For these sites, it may be wasteful or even dangerous to attempt remediation without knowing the range of values or even what critical parameters may exist that could affect the remedial technologies. Deep contamination and highly complex geologies and some mixed-waste problems reside in this category. Currently, we are relegated to containing the contaminant releases and mitigating their effects while we develop further cleanup technologies.

The situation requires that we do two things:

1. Develop better detection technologies to better assess the values of these critical operating parameters at the sites. This should be a major component of this technology development effort.
2. Change the scheme for remediation to account for the uncertainty: the lack of an ability to accurately assess the values of the critical parameters prior to remediation.

   Acquiring this knowledge requires the establishment of a research development test and evaluation infrastructure that can identify what the data/information gaps are (absence of performance knowledge in all or part of the performance range) and fill them with credible test results. We also need to transfer them effectively to the professional engineering and scientific community along with the public government and other stakeholders. Currently, this is not happening. Research and development efforts to address these environmental technology problems are underfunded.

   Furthermore, there is no common set of measurement criteria for testing the technologies, and, there is no program for the systematic investigation and identification of critical parameters and the investigation of performance across a range of values. To do this correctly, we need an infrastructure that can credibly build this knowledge and transfer it to the practitioners.

3. *Establish the facilities for testing environmental technologies.*

   Sound, trustworthy information about the performance of assessment and remediation technologies needs to be developed and transferred to the scientific and engineering community. Right now there is no shortage of information about technology. The problem is that the quality of that information is unknown. We propose the establishment of environmental technology test and evaluation facilities. These "Underwriters' Laboratories-like" facilities would test technologies across a broad range of conditions and certify to their performance. Facilities, such as the one proposed in 1984, are an essential component of an effective technology development program.

   In my view, we have blurred the distinctions among laboratory, bench tests, pilot-scale tests, and field tests and demonstrations. In order to determine how a technology performed across the range of values of its critical parameters, we need to set up experiments in which one critical parameter is varied while holding all other parameters constant. Such experiments must be done in facilities under controlled conditions. Under the current paradigm, we tended to slip a few steps. We moved from R&D stages to field tests and demonstration without fully understanding the performance of the technologies in question for the full range of critical parameters.

   A vivid example of this slippage occurred with the recent failure of a remedial process using a new in situ vitrification (ISV) process. It has been reported that the process caught fire during one remediation effort, causing the technology to be pulled out of commercial use for further development.

   Demonstrations of performance (such as the SITE program) of technologies are not enough, because they do not produce complete information about the performance of the technologies exposed to a known range of critical parameter values. Without this level of understanding, successful results are seen as site specific and not necessarily applicable to other sites. Without full knowledge of critical parameter values at the site under study, how can anyone be sure that technology would work at another site containing different values for critical parameters.

   I should add that we do not see the creation or operation of these facilities as a major market for our firm (though clearly we want to be involved in the design of such facilities). Rather, to keep our environmental business viable, we desperately need the *results* of the testing to be performed by those facilities.

   Some small "T&E-type" facilities already exist. For example, the University of Wyoming has an Environmental Simulation Facility that can test technologies under controlled environmental conditions.

Mr. Chairman and members of the Committee, I wish to thank you for this "from the trenches" opportunity to share my observations on this new and important legislative initiative. If you have any questions, or would like for me to elaborate on any part of my testimony, please do not hesitate to contact me. I can be reached at (206)453-5000.

TESTIMONY OF GIRARD F. ANDERSON, PRESIDENT, TAMPA ELECTRIC CO. (TAMPA, FLORIDA) AND ROBERT McPHAIL, GENERAL MANAGER, BASIN ELECTRIC POWER COOPERATIVE

Mr. Chairman, on behalf of Tampa Electric and Basin Electric Power Cooperative, we are pleased to submit this testimony. We also serve as co-chairmen of the Electric Council for the Economy, Inc. (ECE), a non-profit organization comprised of rural electric cooperatives, investor-owned utilities, manufacturing and service companies, and others who are interested in applications and innovations in electric technology that will lead the nation's economic recovery while improving the environment.

Speaking for Tampa Electric, Basin Electric Power Cooperative, and the ECE, we want to advise you of our support of that part of S. 978, The National Environmental Technology Act of 1993, which establishes The National Environmental Technologies Institute within the EPA. We are interested in Insuring that electric technologies are incorporated into the programs offered through the Institute. A wide range of electric technologies exist with potential to improve the nation's environmental quality by reducing waste and pollution and by increasing energy efficiency. Through Cooperative Research and Development Agreements established under this legislation, the electric industry can work with the Institute to accelerate market introduction of these commercially viable environmental technologies.

The members of the Electric Council for the Economy seek to:

- Stimulate development of new technologies and ease their entry into traditional markets;
- Improve industry and manufacturing productivity while reducing environmental impacts;
- Reduce the cost of meeting environmental goals.

The ECE believes that electric technologies will make an important contribution to the stated goals of the Environmental Technologies Act. They will improve environmental quality as well as reduce our country's total energy demands. Environmental electric technologies can reduce air pollution, reduce manufacturing waste, and play a central role in municipal and industrial recycling and waste management. Targeted incentives for developing new technologies in the pre-commercial stage will accelerate their introduction into the marketplace.

Electric technologies *efficiently* use electricity as their primary energy source. Familiar examples include computers, fax machines, microwave dryers, cordless electric lawn mowers, lasers, robots, electric beam welding and other technologies that are fueling America's economic expansion. Because electric technologies generate no emissions at the point of use, they can also play a vital role in minimizing air pollution, particularly in heavily populated urban areas. Compared with traditional on-site fuel burning, operating an electric lawn mower for four hours, driving an electric car 18 miles, or using microwaves to manufacture 50 pounds of dried pasta would each save energy and eliminate about two pounds of CO2 emissions. These and other electric technologies can reduce smog emissions such as nitrogen oxides and hydrocarbons.

Numerous environmental electric technologies offer the potential of achieving "zero waste" manufacturing. One promising example is infrared recycling of waste foundry sand. Infrared reclaimers installed in U.S. foundries could eliminate the need to dispose of 7 million tons of contaminated waste sand per year. In addition, using coal to generate the electricity to power the reclaimers would result in a net reduction in the nation's carbon dioxide emissions of about 3 billion pounds annually compared to the emissions produced by trucking waste sand to landfills. Other manufacturing electric technologies use microwaves to recycle old asphalt and convert soft waste woods to structural lumber.

Electric technologies can also clean waste and contaminated water. One example is treating infectious waste with microwaves. Final output is suitable for municipal landfill or toxic-free incineration. Another example is using electrically-generated ultraviolet light to destroy toxins in municipal and residential water.

In keeping with the goals of this act, the development and commercialization of electric technologies will also play an important role in improving the competitiveness of American companies. Due to enactment of the National Energy Policy Act in 1992, business decisions and national policy now include conservation, energy efficiency and environmental protection. The result is more competitively priced products, increased demand and higher employment. Preliminary research shows that advances in electric technologies account for 30-40 percent of all technological innovation, 50 percent of all production-related innovation and 30-36 percent of all pat-

ents in the United States. The National Academy of Sciences stated in their 1986 publication: *Electricity in Economic Growth*:

> "Historically, technical change exploiting the special qualities of electricity has contributed to increased productivity and thereby Increases In gross national product. We can expect this trend to continue."

The electric Industry and the ECE look forward to working with the Committee and the Clinton Administration to establish the National Environmental Technology Institute and to place greater emphasis on encouraging electric technologies to improve our nation's energy efficiency and environmental quality, while increasing productivity and stimulating economic growth.

Thank you for giving us this opportunity to submit testimony on this important legislation.

II

103D CONGRESS
1ST SESSION

S. 978

To establish programs to promote environmental technology, and for other purposes.

IN THE SENATE OF THE UNITED STATES

MAY 18 (legislative day, APRIL 19), 1993

Mr. BAUCUS (for himself, Mr. LIEBERMAN, Ms. MIKULSKI, Mr. KERRY, Mr. WOFFORD, and Mr. LAUTENBERG) introduced the following bill; which was read twice and referred to the Committee on Environment and Public Works

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A BILL

To establish programs to promote environmental technology, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "National Environmental Technology Act of 1993".

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Sec. 1. Short title; table of contents.
Sec. 2. Findings.
Sec. 3. Definitions.

TITLE I—NATIONAL ENVIRONMENTAL TECHNOLOGY PANEL

Sec. 101. Establishment.
Sec. 102. Membership.
Sec. 103. National environmental technology strategy.
Sec. 104. Coordination of budget requests for environmental technology.
Sec. 105. Report to Congress.
Sec. 106. Termination.

TITLE II—NATIONAL ENVIRONMENTAL TECHNOLOGIES INSTITUTE; CLEARINGHOUSE

Sec. 201. Purposes.

Subtitle A—National Environmental Technologies Institute

Sec. 211. Establishment.
Sec. 212. Reports.
Sec. 213. Environmental technology trade promotion.

Subtitle B—Environmental Technology Clearinghouse

Sec. 221. Database.

TITLE III—ENVIRONMENTAL INNOVATION RESEARCH PROGRAM; TECHNOLOGY TESTING

Sec. 301. Findings; purpose.

Subtitle A—Environmental Innovation Research Program

Sec. 311. Environmental innovation research program.
Sec. 312. Guidelines and regulations of the environmental innovation research program.

Subtitle B—Innovative Technology Testing

Sec. 321. Program.

TITLE IV—ADDITIONAL PROGRAMS

Subtitle A—Verification of Environmental Technologies

Sec. 401. Program.

Subtitle B—Environmental Technology Advisory Council

Sec. 411. Establishment.
Sec. 412. Report by the Comptroller General.

Subtitle C—Coordination With National Institute of Standards and Technology

Sec. 421. Coordination with National Institute of Standards and Technology.
Sec. 422. Coordination with other federally supported extension programs.

SEC. 2. FINDINGS.

Congress finds that—

(1) environmental problems facing the world pose a threat to the environmental and economic security of the United States and other nations;

(2) promoting a sound economy while maintaining a healthy environment is among the urgent public policy challenges of the United States, on both domestic and international levels;

(3) the development and deployment of environmental technologies will both enhance global environmental security and the economic standing of the United States in the world marketplace;

(4) the growing demand for environmentally sound products and processes, and for cost-effective environmental cleanup and pollution control technologies, presents strategic business opportunities;

(5) advances in environmental cleanup, pollution control, and pollution prevention technologies could significantly reduce Government and private cleanup expenditures and improve cleanup results;

(6) innovative environmental technologies face barriers to commercialization and diffusion, and are often slow to be adopted;

(7) while the Federal Government, research institutes, universities, and industries are conducting

substantial relevant basic environmental research and development—

(A) environmental concerns must become a more pervasive and central dimension of technology research and development; and

(B) Federal environmental technology research and development programs should be better coordinated and better aligned with long-term, strategic environmental needs and business opportunities; and

(8) a coordinated, up-to-date, interagency strategy for environmental technology will greatly help the United States develop critical environmental technology that can respond to environmental programs and create jobs and new sources of income.

SEC. 3. DEFINITIONS.

As used in this Act:

(1) ADMINISTRATOR.—The term "Administrator" means the Administrator of the Environmental Protection Agency.

(2) COVERED FEDERAL AGENCY.—The term "covered Federal agency" means a Federal agency for which, for a fiscal year, an amount greater than $50,000,000 is made available for environmental cleanup.

(3) CRITICAL ENVIRONMENTAL TECHNOLOGY.—The term "critical environmental technology" means environmental technology that—

(A) embodies a significant technical advance;

(B) has the potential to bring about large, cost-effective reductions in risk to human health or the environment;

(C) is generically applicable at the precommercial stage; and

(D) if adopted, would result in a favorable ratio of social to private returns.

(4) DIRECTOR.—The term "Director" means the head of the National Environmental Technology Institute established under section 211.

(5) ENVIRONMENTAL INNOVATION RESEARCH.—The term "environmental innovation research" means research related to the development, application, or commercialization of environmental technology.

(6) ENVIRONMENTAL TECHNOLOGY.—The term "environmental technology" means a technology, product, or process that reduces environmental risks by—

(A) fulfilling a function other than protection of the environment with less impact during its manufacture, use, or disposal on the environment than other technologies, products, and processes; and

(B) protecting or enhancing the environment through pollution control, prevention, or environmental remediation.

(7) FUND.—The term "Fund" means the Environmental Advanced Research Projects Revolving Fund established under section 211(f).

(8) FUNDING AGREEMENT.—The term "funding agreement" means a contract, cooperative agreement, grant agreement, patent agreement, royalty agreement, license agreement, equity agreement, or other appropriate legal agreement between the head of a covered Federal agency and a private business concern to provide funding and support to carry out environmental innovation research.

(9) INSTITUTE.—The term "Institute" means the National Environmental Technologies Institute established under section 211.

(10) SMALL BUSINESS CONCERN.—The term "small business concern" means a business concern that is recognized as a small business concern under

section 3(a) of the Small Business Act (15 U.S.C. 632(a)).

TITLE I—NATIONAL ENVIRONMENTAL TECHNOLOGY PANEL

SEC. 101. ESTABLISHMENT.

There is established within the Office of Science and Technology Policy a National Environmental Technology Panel (referred to in this section as the "Panel"), to operate as a Presidential initiative panel of the Federal Coordinating Council for Science, Engineering, and Technology. The Panel shall be responsible for coordinating environmental technology programs within the Federal Government and the development of a National environmental technology strategy.

SEC. 102. MEMBERSHIP.

The Panel shall consist of—

(1) the Administrator;

(2) the Director of the National Science Foundation;

(3) the Administrator of the National Oceanic and Atmospheric Agency of the Department of Commerce;

(4) the Secretary of Energy;

(5) the Secretary of the Interior;

(6) the Administrator of the National Aeronautics and Space Administration;

(7) the Secretary of Agriculture;

(8) the Secretary of Defense;

(9) the Secretary of Health and Human Services;

(10) the Secretary of Commerce;

(11) the Secretary of Transportation;

(12) the United States Trade Representative;

(13) the Director of the National Environmental Technologies Institute; and

(14) the Director of the Office of Science and Technology Policy, who shall serve as the Chairperson of the Panel (referred to in this title as the "Chairperson").

SEC. 103. NATIONAL ENVIRONMENTAL TECHNOLOGY STRATEGY.

(a) DEVELOPMENT OF NATIONAL ENVIRONMENTAL TECHNOLOGY STRATEGY.—Not later than 1 year after the date of enactment of this Act, the Panel shall develop a National Environmental Technology Strategy.

(b) STRATEGY REQUIREMENTS.—The Strategy shall—

(1) identify critical environmental technologies for focused governmental support;

(2) prioritize the technologies identified in paragraph (1) based on trends in global and domestic environmental problems and the potential for economic benefits;

(3) recommend effective public and private partnership arrangements for the development and diffusion of environmental technologies;

(4) recommend approaches to encourage the commercialization and diffusion of environmental technologies, with special attention to small- and medium-sized business concerns;

(5) identify economic, regulatory, and other barriers and incentives to the development, deployment, and trade in environmental technologies;

(6) recommend administrative actions to remove barriers to and create incentives for the development and diffusion of environmental technology;

(7) recommend administrative actions to promote and assist trade in United States environmental technology; and

(8) recommend, as appropriate, changes in Federal procurement guidelines to promote the purchase of environmental technology.

(c) REVISION OF STRATEGY.—The Panel shall review and revise the Strategy not less frequently than once every 3 years.

(d) COORDINATION WITH OTHER GROUPS.—

(1) IN GENERAL.—The Panel shall consult with organizations involved in formulating Federal technology policy, organizations involved in technology development and commercialization, and organizations involved in making recommendations for redirecting research on military applications to civilian uses, including—

(A) the National Critical Technologies Panel established under section 601 of the National Science and Technology Policy, Organization, and Priorities Act of 1976 (42 U.S.C. 6681);

(B) the Advanced Manufacturing Council of the Federal Council established under section 401 of such Act (42 U.S.C. 6651);

(C) the Defense Technology Conversion Council of the Advanced Research Projects Agency of the Department of Defense;

(D) the Advanced Research Projects Agency of the Department of Defense;

(E) the Advanced Technology Program established under section 28 of the National Institutes of Standards and Technology Act (15 U.S.C. 278n);

(F) the Strategic Environmental Research and Development Program Council established under section 2902 of title 10, United States Code;

(G) the Environmental Technology Advisory Council established under section 411; and

(H) the environmental innovation and research program established under section 311.

(2) RECOMMENDATIONS.—The Panel shall make recommendations to the organizations covered in paragraph (1) to avoid duplication of efforts and to promote coordination of environmental technology efforts.

(3) TECHNICAL SUPPORT.—The Chairperson shall provide technical assistance regarding policy formulation to the Panel and may request technical and policy assistance from members of the Panel and other organizations, including the Academies of Science and Engineering.

SEC. 104. COORDINATION OF BUDGET REQUESTS FOR ENVIRONMENTAL TECHNOLOGY.

(a) STATUS OF FEDERAL ACTIVITY.—Not later than 180 days after the date of enactment of this Act, and annually thereafter, the Chairperson, in consultation with the Director of the Office of Management and Budget, shall—

(1) submit to Congress a listing of all federally funded activities that promote, develop, or support environmental technology; and

(2) review the budget summary to determine whether the summary is consistent with the strategy developed under section 103.

(b) REPORT.—The Chairperson shall report any comments or views of the Panel regarding the budget summary to the Director of the Office of Management and Budget.

(c) CONSIDERATION BY DIRECTOR OF OFFICE OF MANAGEMENT AND BUDGET.—The Director of the Office of Management and Budget shall—

(1) consider all Federal agency requests for research related to environmental technology as one integrated, coherent, and multiagency request; and

(2) review the budget summary developed in subsection (a) and the comments submitted in sub-

section (b) prior to submission of the annual budget request of the President.

SEC. 105. REPORT TO CONGRESS.

Not later than 1 year after the date of enactment of this Act, and annually thereafter, the Chairperson shall submit a report to Congress that includes—

(1) a summary of all Panel activities;

(2) the most recently prepared version of the strategy developed under section 103;

(3) any major findings of the Panel;

(4) the interagency budget summary developed under section 104 with any comments submitted by the Chairperson;

(5) descriptions of significant research initiatives in environmental technology;

(6) a listing of all public and private partnerships in critical environmental technology, including projects funded by—

(A) the Advanced Research Projects Agency of the Department of Defense, excluding any classified information;

(B) the Advanced Technology Program established under section 28 of the National Institutes of Standards and Technology Act (15 U.S.C. 278n);

(C) the National Environmental Technologies Institute established under section 211; and

(D) the environmental innovations research program under section 311; and

(7) a listing of all federally funded activities that promote, develop, or support critical environmental technology identified under section 103(b)(1).

SEC. 106. TERMINATION.

The authority provided by this title shall terminate on the date that is 7 years after the date of enactment of this Act.

TITLE II—NATIONAL ENVIRONMENTAL TECHNOLOGIES INSTITUTE; CLEARINGHOUSE

SEC. 201. PURPOSES.

It is the purpose of this title to improve the environment and strengthen the economic competitiveness of the United States through—

(1) assisting private industry, universities, nonprofit research centers, and Government laboratories in developing and commercializing environmental technologies; and

(2) facilitating the diffusion, adoption, and export of environmental technologies by improving the information available on new environmental technologies.

Subtitle A—National Environmental Technologies Institute

SEC. 211. ESTABLISHMENT.

(a) IN GENERAL.—

(1) ESTABLISHMENT OF INSTITUTE.—There is established within the Environmental Protection Agency the National Environmental Technologies Institute (referred to in this section as the "Institute").

(2) DIRECTOR.—The Institute shall be headed by a Director who shall be appointed by the President, with the advice and consent of the Senate.

(3) CONFORMING AMENDMENT.—Section 5316 of title 5, United States Code, is amended by adding at the end the following:

"Director of the National Environmental Technologies Institute, Environmental Protection Agency.".

(b) FUNCTIONS.—The Director shall—

(1) in cooperation with the heads of other agencies, support and assist the development of products

oriented research, development, and demonstration of environmental technology at the precommercial stage by industrial, academic, governmental, and nongovernmental entities;

(2) monitor on a continuing basis the research and development being conducted on environmental technologies by private industry in the United States and provide technical assistance to private industry conducting environmental research;

(3) in cooperation with the heads of other agencies, develop and transfer environmental technologies and mechanisms to address international environmental problems;

(4) develop and maintain a clearinghouse, as established under subtitle B, to provide information to private and public concerns that develop, apply, or export environmental technology;

(5) advise other officials, as appropriate, within the Environmental Protection Agency, and within other Federal departments and agencies, on programs and strategies for promoting the development and diffusion of environmental technology, including program managers for the environmental innovation research program established under subtitle A of title III, as appropriate;

(6) to the extent allowable by law, in cooperation with the Administrator or the head of any other Federal agency that the Director determines to be appropriate, ensure the availability of an initial market for critical environmental technologies;

(7) make recommendations for changes in Federal procurement guidelines to ensure the availability of an initial market for environmental technology; and

(8) consult with the Panel established under title I and the programs established under title III.

(c) COOPERATIVE AGREEMENTS AND OTHER ARRANGEMENTS.—

(1) IN GENERAL.—In carrying out the functions of the Institute under this subtitle, the Director may enter into cooperative agreements or other arrangements with—

(A) any department, agency, or independent establishment of the United States;

(B) any unit of State or local government;

(C) any educational institution;

(D) any company that is a United States-owned company; or

(E) any company that the Secretary finds is incorporated in the United States and has a

parent company that is incorporated in a country that—

(i) affords to United States-owned companies opportunities, comparable to those afforded to any other company, to participate in any cooperative agreement similar to those authorized under this subsection;

(ii) affords to United States-owned companies local investment opportunities comparable to those afforded to any other company; and

(iii) affords adequate and effective protection for the intellectual property rights of United States-owned companies.

(2) AUTHORITY TO REQUIRE PAYMENT.—

(A) IN GENERAL.—A cooperative agreement or other arrangement entered into under paragraph (1) may include a provision that requires a person or other entity to make a payment or payments to the Institute (or any other department, agency, or independent establishment of the United States) as a condition of receiving assistance from the Institute under the agreement or other arrangement.

(B) AMOUNT OF PAYMENT.—The amount of any payment received by a department, agency, or independent establishment of the United States pursuant to paragraph (1) shall be credited to the Fund in such amount as the Director specifies.

(C) NONDUPLICATION AND OTHER CONDITIONS.—The Director shall ensure that, to the extent practicable, a cooperative agreement or other arrangement entered into under this section—

(i) does not provide for research that duplicates research being conducted under other programs carried out by the private sector or by a department, agency, or independent establishment of the United States; and

(ii) requires the other party to the agreement or arrangement to share the cost of the project or activity concerned.

(d) FEDERAL SHARE.—

(1) IN GENERAL.—Subject to paragraph (2), the Federal share of the cost of a research and development project under this section may not exceed 50 percent.

(2) SMALL BUSINESS EXCEPTION.—The Federal share of the cost of a research and development project conducted pursuant to a cooperative agreement or other arrangement entered into with a small business concern under subsection (c) may not exceed 75 percent.

(e) PROGRAM REQUIREMENTS.—

(1) SELECTION CRITERIA.—

(A) IN GENERAL.—Not later than 180 days after the date of enactment of this section, the Director shall publish in the Federal Register proposed criteria, and not later than 1 year after the date of enactment of this section, following a public comment period, final criteria, for the selection of recipients of contracts, leases, grants, and cooperative agreements under this section.

(B) CRITERIA.—Selection criteria under subparagraph (A) shall—

(i) include requirements outlining business plans;

(ii) address the advancement of United States environmental technology and the promotion of the competitiveness of businesses of the United States; and

(iii) give special consideration to the needs of small business concerns.

(2) ADMINISTRATION OF PROGRAM FUNDS.—In cooperation with the heads of other agencies, the Director shall—

(A) determine categories of projects to be funded by the National Environmental Technologies Institute;

(B) issue solicitations for projects to be funded by the Institute;

(C) receive and evaluate proposals resulting from solicitations;

(D) select participants for funding agreements of the Institute;

(E) administer the funding agreements of the Institute; and

(F) make payments to recipients of funding agreements on the basis of progress toward, or completion of, the funding agreement requirements.

(3) CONSULTATION.—The Director shall, as appropriate, consult with the Panel established in title I and with the Environmental Technology Advisory Council established in subtitle B of title IV.

(4) FINANCIAL REPORTING AND AUDITING.—The Director, in consultation with the chief financial officer of the Environmental Protection Agency, shall establish financial reporting and auditing procedures to ensure that contracts and awards—

(A) are used for the purposes specified in this section;

(B) are made in accordance with sound accounting practices; and

(C) are not used for research programs existing or planned on the date of enactment of this section that would be substantially conducted in the same time period in the absence of financial assistance under this subtitle.

(5) DISSEMINATION OF RESEARCH RESULTS.—The Director shall provide for the dissemination of research results of the programs of the Institute established under this subtitle through the database established under section 221.

(6) CONTRACTS OR AWARDS; CRITERIA; RESTRICTIONS.—

(A) IN GENERAL.—No contract or award may be made under this section until the research project in question has been subject to a merit review by the Environmental Tech-

nology Advisory Council established under section 411, and has, in the opinion of the reviewers, been shown to have scientific and technical merit.

(B) DIRECT COSTS ONLY.—Federal funds made available under this subtitle shall be used only for direct costs and not for indirect costs, profits, or management fees of any contractor.

(C) CONSIDERATION.—In determining whether to make an award to a joint venture, the Director shall consider whether the members of the joint venture have provided for the appropriate participation of small businesses of the United States in the joint venture.

(D) ADMINISTRATIVE PROCEDURE.—Section 552 of title 5, United States Code, shall not apply to the following information obtained by the Federal Government on a confidential basis in connection with the activities of any business or joint venture that receives funding under this section:

(i) Information on the business operation of a member of the business or joint venture.

(ii) Trade secrets possessed by any business or by a member of the joint venture.

(E) INTELLECTUAL PROPERTY.—Intellectual property owned and developed by a business or joint venture that receives funding under this subtitle or by any member of such a joint venture may not be disclosed by any officer or employee of the United States except in accordance with a written agreement between the owner or developer and the Director.

(F) LICENSING FEES AND ROYALTIES.—The United States shall be entitled to a share of the licensing fees and royalty payments made to and retained by a business or joint venture to which the United States contributes under this section in an amount that is proportionate to the Federal share of the costs incurred by the business or joint venture, as determined by an independent audit.

(G) DISCONTINUANCE.—A contract or award under this subtitle shall contain appropriate provisions for the discontinuance of the project and the return of the unspent Federal funds to the Institute (after payment of all al-

lowable costs and an audit) if it appears that, due to technical difficulties, financial difficulty on the part of the recipient, or for any other reason, the recipient is not making satisfactory progress toward successful completion of the project.

(H) DISSOLUTION; RESIDUAL ASSETS.—Upon dissolution of a joint venture that receives funding under this section or at a time otherwise agreed upon, the United States shall be entitled to a share of the residual assets of a joint venture that is proportionate to the Federal share of the costs of the joint venture, as determined by an independent audit.

(f) REVOLVING FUND.—

(1) ESTABLISHMENT.—There is established in the Treasury of the United States a revolving fund to be known as the "Environmental Advanced Research Projects Revolving Fund" (referred to in this section as the "Fund"), that shall consist of such amounts as are appropriated or credited to the Fund from time to time.

(2) EXPENDITURES FROM THE FUND.—Amounts in the Fund shall be available, as provided in appropriations Acts, to carry out this section.

(3) LOANS, GRANTS, LOAN GUARANTEES, AND OTHER FINANCIAL ASSISTANCE.—

(A) IN GENERAL.—The Director may use the Fund for the purpose of making loans, grants, loan guarantees (of both principal and interest), and other financial assistance to industrial and nonprofit research centers, universities, and other entities that serve the long-term environmental security needs of the United States, to carry out this subtitle.

(B) REPAYMENT SCHEDULE.—A loan made under this section shall—

(i) have a repayment schedule and maturity date determined by the Secretary of the Treasury;

(ii) bear interest at a rate determined by the Secretary of the Treasury (as of the close of the calendar month preceding the month in which the loan is made) to be 3 percent less than the current market yield on outstanding marketable obligations of the United States with remaining periods to maturity comparable to the period for which the loan is made.

(C) REPAYMENTS.—Repayments on a loan made under this section and the proceeds from any other agreement entered into by the Director under this subtitle shall be credited to the Fund.

(4) MANAGEMENT OF FUND.—

(A) IN GENERAL.—The Secretary of the Treasury shall manage the Fund and, after consultation with the Director, report to Congress each year on the financial condition and the results of the operation of the Fund during the preceding fiscal year and on the expected condition and operations of the Fund during the next 5 fiscal years.

(B) INVESTMENT.—

(i) AUTHORITY TO INVEST.—Subject to clause (ii), the Secretary of the Treasury shall invest the portion of the Fund that is not, in the judgment of the Secretary, required to meet current withdrawals.

(ii) LIMITATION.—Investments of moneys in the Fund may be made only in interest-bearing obligations of the United States.

(g) AUTHORIZATION OF APPROPRIATIONS.—

(1) AMOUNTS.—There are authorized to be appropriated to the Institute to carry out this section—

(A) $36,000,000 for fiscal year 1994;

(B) $80,000,000 for fiscal year 1995; and

(C) $120,000,000 for fiscal year 1996.

(2) LIMITATION ON USE.—Of amounts appropriated to the Institute, not more than 5 percent may be used to pay for administrative expenses of the Institute.

(3) FEDERAL COOPERATIVE AGREEMENTS.—The Director shall allocate a significant percentage of the amounts made available to the Institute for the purpose of entering into cooperative agreements with departments, agencies, or independent establishments of the United States pursuant to subsection (c)(1).

SEC. 212. REPORTS.

(a) IN GENERAL.—The Director shall, not less frequently than annually, and at such other times as the Director considers to be appropriate, submit a report to the Committees on Environment and Public Works and Appropriations of the Senate, and the Committees on

Science, Space, and Technology and Appropriations of the House of Representatives describing—

(1) the activities of the Institute, including descriptions and funding levels of all projects developed with assistance from the Institute;

(2) each phase of the implementation and operation of the environmental innovation research programs administered by the Director and the heads of covered Federal agencies under subtitle A of title III;

(3) the plans of the Institute for future activities;

(4) the manner and extent to which technologies developed with assistance from the Institute have been commercialized and used; and

(5) the extent to which the technologies have been transferred to foreign nations.

(b) RECOMMENDATIONS.—Each report submitted under this section shall include such recommendations for program improvements as the Director considers to be appropriate.

SEC. 213. ENVIRONMENTAL TECHNOLOGY TRADE PROMOTION.

The Director shall—

(1) collect and disseminate through the clearinghouse established under subtitle B, information useful for promoting the export of environmental technology, including information concerning—

(A) sources of financial assistance;

(B) sources of technical assistance; and

(C) the environmental needs of foreign nations;

(2) as appropriate, consult with the heads of other Federal agencies to facilitate the export of environmental technologies; and

(3) consult with—

(A) the Working Group on the Environment of the Trade Promotion Coordinating Council; and

(B) the National Environmental Technology Trade Initiative within the Department of Commerce,

regarding the appropriate administrative actions for the promotion of trade in environmental technology.

Subtitle B—Environmental Technology Clearinghouse

SEC. 221. DATABASE.

(a) ESTABLISHMENT.—Not later than 2 years after the date of enactment of this section, the Administrator

shall establish an operational electronic database to serve as a clearinghouse for the collection and dissemination of nonproprietary information on environmental technology.

(b) CONTENTS.—The database shall include—

(1) descriptions of environmental technologies verified under the program established under section 401;

(2) descriptions of environmental technologies tested under the program established under section 321;

(3) descriptions of environmental technologies developed under programs of the Institute under section 311;

(4) descriptions of environmental technologies developed under the environmental innovation research programs established under title III;

(5) analytical test results, costs, vendor information, performance specifications, and other appropriate information for all environmental technologies described in the database;

(6) information useful for promoting the export of environmental technology, including information concerning—

(A) sources of financial assistance;

(B) sources of technical assistance; and

(C) the environmental needs of foreign nations; and

(7) other relevant information on environmental technology.

(c) ACCESS TO CLEARINGHOUSE.—The clearinghouse shall be made available through an electronic data system (such as a computer bulletin board) and in paper report format, and shall be accessible to all persons and groups interested in environmental technology, including—

(1) industries that may use the evaluated environmental technologies either for compliance with any applicable regulations or voluntarily;

(2) Federal, State, and local programs likely to review permit applications proposing use of environmental technologies; and

(3) Federal, State, and local programs responsible for developing regulations establishing a level of performance or specific equipment for the prevention, mitigation, or abatement of environmental pollution.

(d) ADMINISTRATION.—

(1) UPDATING.—The data stored in the clearinghouse shall be updated continuously as new information is made available, but not less often than every 12 months.

(2) EXISTING RESOURCES.—The clearinghouse shall build on existing data sources and, to the extent feasible, shall be integrated with other technology databases maintained by the Environmental Protection Agency on the date of enactment of this section.

(3) OUTREACH.—The Administrator shall conduct appropriate outreach efforts to advertise, deliver, and disseminate the information stored in the clearinghouse.

(e) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated such sums as are necessary to carry out this section.

TITLE III—ENVIRONMENTAL INNOVATION RESEARCH PROGRAM; TECHNOLOGY TESTING

SEC. 301. FINDINGS; PURPOSE.

(a) FINDINGS.—Congress finds that:

(1) estimates of the cost to clean up the contaminated sites in the United States range as high as $1,000,000,000 over the next 30 years;

(2) the Office of Technology Assessment has found that, at some Federal sites, it may be impossible with current technology to remove contami-

nants from groundwater plumes and deeply buried soils;

(3) new technologies are needed to address these serious contamination problems in a more timely and cost-effective manner, with an enormous potential savings for the Government and private industry;

(4) the use of innovative technologies at certain contaminated sites has reduced site cleanup costs by more than half; and

(5) demonstration and testing of environmental technologies for performance and cost characteristics is often a barrier to successful commercialization of environmental technology.

(b) PURPOSE.—It is the purpose of this title to reduce Federal and private cleanup costs by promoting the development and commercialization of environmental technologies.

Subtitle A—Environmental Innovation Research Program

SEC. 311. ENVIRONMENTAL INNOVATION RESEARCH PROGRAM.

(a) ESTABLISHMENT.—The head of each covered Federal agency shall establish an environmental innovation research program for the development and commer-

cialization of environmental technology to further the progress of cleanup, pollution prevention, or abatement activities of the agency.

(b) FUNDING.—

(1) IN GENERAL.—The head of each covered Federal agency shall annually—

(A) notwithstanding any other provision of law—

(i) set aside not less than 1.25 percent of the amount of funds made available to the agency for environmental cleanup; and

(ii) reserve the amount set aside under clause (i) for awards to private concerns or other entities for the development and commercialization of environmental technology through a uniform process as described in subsection (e); and

(B) consult with the Environmental Technology Advisory Council established under section 411 and the Panel established under title I concerning the expenditure of the funds set aside pursuant to subparagraph (A).

(2) CONSTRUCTION.—Nothing in this Act shall be construed to limit the amount of funds that a

covered Federal agency may spend on the research, development, or commercialization of environmental technology or any other environmental activity.

(c) DUTIES OF HEADS OF COVERED FEDERAL AGENCIES.—In carrying out an environmental innovation research program established under this section, the head of each covered Federal agency shall, in accordance with the requirements of this section—

(1) certify annually the amount of agency funds set aside in accordance with subsection (b)(1)(A);

(2) determine categories of projects to be included in the environmental innovation research program of the agency;

(3) issue environmental innovation research solicitations;

(4) receive and evaluate proposals resulting from the solicitations;

(5) select participants for the environmental innovation research funding agreements of the covered Federal agency;

(6) in administering paragraphs (3), (4), and (5), consider the needs of small business concerns;

(7) administer the environmental innovation research funding agreements of the covered agency (or delegate the administration to another agency);

(8) make payments to recipients of environmental innovation research funding agreements on the basis of progress toward, or completion of, the funding agreement requirements; and

(9) submit an annual report on the environmental innovation research program to the National Environmental Technologies Institute established in section 211 and the Office of Science and Technology Policy, which shall include—

(A) an accounting of the number and amount of awards made under the environmental innovation research program, classified by categories of projects; and

(B) the amount of funds awarded to projects for environmental cleanup, expressed as a percentage of the total funds awarded.

(d) COOPERATIVE AGREEMENTS.—The head of each covered Federal agency may enter into a cooperative agreement with the head of another Federal agency for the provision of technical assistance and other appropriate assistance to business concerns or other entities conducting an approved project.

(e) PHASES OF ENVIRONMENTAL INNOVATION RESEARCH PROGRAM.—The head of each covered Federal

agency shall carry out an environmental innovation research program consisting of the following 3 phases:

(1)(A) A first phase for determining, insofar as possible, the scientific and technical merit and feasibility of ideas that appear to have commercial potential, submitted pursuant to environmental innovation research program solicitations.

(B) With respect to the first phase, the head of the covered Federal agency may enter into funding agreements with governmental, industrial, academic, and other nongovernmental entities, each of which shall be in an amount not to exceed $250,000.

(2)(A) A second phase to further develop proposals that meet particular program needs, and with respect to which awards shall be made on the basis of the scientific and technical merit and feasibility of each proposal, as evidenced by the first phase (as described in paragraph (1)), taking into consideration, among other considerations, the commercial potential of each proposal, as evidenced by—

(i) the record of the private concern or other entity of successfully commercializing environmental innovation research or other research;

(ii) the existence of funding commitments for the second phase carried out under this paragraph from the private sector or sources other than the environmental innovation research programs to fund the development phase;

(iii) the existence of follow-on commitments for the third phase carried out under paragraph (3) for research conducted pursuant to this clause; and

(iv) the presence of other indicators of the commercial potential of the proposal.

(B) With respect to the second phase, the head of the covered Federal agency may enter into funding agreements with private concerns or other entities, each of which shall be in an amount not to exceed $750,000, unless the head of the covered Federal agency finds that additional funding is necessary and appropriate.

(3)(A) If appropriate, a third phase, in which—

(i) environmental innovation research funding is used to continue development activity that has demonstrated outstanding commercial potential in the second phase of the environ-

mental research program and merits further environmental innovation research funding;

(ii) awards from funding sources other than the environmental innovation research programs are used for the continuation of research or research and development that has been competitively selected using peer review or scientific review criteria; or

(iii) commercial applications of research or research and development funded by environmental innovation research programs are funded by non-Federal sources of capital or, for products or services intended for use by the Federal Government, by Federal funding sources other than environmental innovation research programs.

(B) With respect to a research and development project funded under subparagraph (A)(i), the Federal share shall not exceed 50 percent of the total cost of the project.

(C) With respect to the assistance provided under this paragraph, the covered Federal agency may also assist the private concern or other entity in pursuing funding or procurement from other Federal cleanup programs and in pursuing financial and

technical assistance for the export of technology developed under the environmental innovation research program.

(4) Funding agreements authorized under paragraphs (2) and (3)(A)(i) may make available, if appropriate, funds to test environmental technology in the program established under section 321.

SEC. 312. GUIDELINES AND REGULATIONS OF THE ENVIRONMENTAL RESEARCH PROGRAM.

(a) GUIDELINES.—Not later than 180 days after the date of enactment of this Act, the Director shall promulgate guidelines for environmental innovation research conducted by covered Federal agencies pursuant to this subtitle.

(b) CONTENTS.—The guidelines promulgated by the Director under subsection (a) shall, at a minimum, provide for—

(1) simplified, standardized, and timely solicitations of project proposals;

(2) a simplified, standardized funding process that provides for—

(A) the timely receipt and review of proposals;

(B) the protection of proprietary information provided in project proposals;

(C) the selection of environmental technology projects;

(D) the retention of rights in data generated in the performance of a contract or other agreement by the private concern under the environmental technology research project;

(E) to the extent allowable by law, the transfer of title to property provided by a Federal agency to the private concern conducting an environmental research project, if the transfer would be more cost-effective than recovery of the property by the Federal agency;

(F) cost sharing; and

(G) cost principles and payment schedules;

(3) exemptions from the requirements of paragraph (2) in any case in which national security or intelligence functions would be jeopardized; and

(4) to the extent allowable by law and as appropriate, minimizing the regulatory burden of each private concern that participates in an environmental technology research project to improve the cost-effectiveness of the environmental technology research and development conducted under the program.

(c) REGULATIONS.—The head of each covered Federal agency shall, on the basis of the guidelines issued

under subsection (a), promulgate such regulations as are necessary to ensure that the environmental innovation research program of the covered Federal agency meets the requirements of the guidelines.

Subtitle B—Innovative Technology Testing

SEC. 321. PROGRAM.

(a) ESTABLISHMENT.—In consultation with other appropriate Federal departments and agencies, the Administrator shall establish a program for testing environmental technology at federally owned facilities and sites listed on the National Priorities List established under section 105(a)(8)(B) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9605(a)(8)(B)), and the inventory of Federal agency hazardous waste facilities under section 3016 of the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6937) (referred to in this section as "applicable sites").

(b) DESCRIPTION.—As part of the program, the Administrator shall—

(1) enter into cooperative agreements with other Federal departments and agencies for the purpose of testing environmental technology at applicable sites;

(2) solicit and accept applications to test environmental technology suitable for prevention, control, or remediation of contamination at applicable sites, subject to the guidelines established under subsection (c);

(3) in consultation and cooperation with other Federal departments and agencies, State and local governments, industry consortia, and other groups interested in control, prevention, and remediation of environmental pollution at any applicable site, manage and oversee testing and evaluation of environmental technology at applicable sites subject to the guidelines established under subsection (c);

(4) document the performance and cost characteristics provided by any environmental technology tested at an applicable site;

(5) list and disseminate, through the clearinghouse established under section 221, nonproprietary information regarding the performance and cost characteristics of environmental technology that has been tested at one or more applicable sites and has been determined to be effective by the appropriate criteria in the guidelines established under subsection (c); and

(6) build upon, not duplicate, and, to the extent feasible, incorporate existing Environmental Protection Agency programs that facilitate testing of environmental technology at applicable sites, including the alternative or innovative treatment technology research and demonstration program established under section 311(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9660(b)).

(c) GUIDELINES.—Not later than 2 years after the date of enactment of this section, the Administrator shall, after notice and opportunity for comment, promulgate guidelines for the operation of the program established under this section. The guidelines shall include—

(1) an initial listing of applicable sites potentially available for testing of environmental technology categorized by site characteristics, including site geology and site contaminants;

(2) the criteria designating eligibility of applicants to the program established under this section, including—

(A) any business concern or consortium;

(B) any small business concern or consortium; or

(C) any nonprofit group, university, or State or local government entity or consortium;

(3) the application procedures for entities designated under paragraph (2) desiring to apply for testing of environmental technology at an applicable site including data, equipment, and findings or demonstrations required in a complete application for testing, including—

(A) appropriate testing and analytical procedures to demonstrate the effectiveness of an environmental technology;

(B) required data, findings, equipment, or demonstrations for a complete application for testing;

(C) provisions for sharing the costs of testing with applicants designated under subparagraph (B) or (C) of paragraph (2) that limit the Federal share to not more than 50 percent of the total cost of testing;

(D) a business plan that includes—

(i) the environmental problem the environmental technology is proposed to address;

(ii) the means by which the technology will be commercialized and marketed; and

(iii) the estimated benefits of the technology, including—

(I) quantitative or qualitative estimates of reductions in health and environmental risks; and

(II) the estimated number of jobs created if the technology is successfully commercialized; and

(iv) the projected capitalization costs and income; and

(E) provisions that provide special consideration to the needs of small business concerns;

(4) criteria for verification of the efficacy of tested environmental technologies, including—

(A) the efficiency of destruction or removal of contaminants;

(B) the reduction in the volume, toxicity, or mobility of contaminants;

(C) the operational and capital costs; and

(D) the operational reliability;

(5) specific procedures for the management and oversight of testing at applicable sites, including procedures for consultation or entering mutual agreements with—

(A) other Federal departments and agencies responsible for management and remediation of applicable sites;

(B) potentially responsible parties responsible for management and remediation of applicable sites;

(C) State and local government entities;

(D) private citizens or citizen groups concerned with management and remediation of applicable sites;

(E) nonprofit organizations concerned with management and remediation of applicable sites; or

(F) any persons or business concerns interested in investing in the commercialization of tested environmental technology; and

(6) appropriate provisions to limit the liability and, to the extent feasible, indemnify successful applicants to the program established under this section.

(d) LISTING OF VERIFIED TECHNOLOGY.—In the case of a technology tested under the program established by this section, the Administrator shall publish the test results, cost information, and a general description of the tested environmental technology, and disseminate the in-

formation through the clearinghouse established under section 221.

(e) AUDIT.—Not later than 3 years after the date of enactment of this Act, the Administrator shall audit the performance of the program and report the results of the audit to Congress, including—

(1) the number of sites where environmental technologies have been tested, classified by the type of problem remedied and the technology tested;

(2) the number of environmental technologies tested that have subsequently become commercially viable;

(3) the number of sites for which environmental technologies tested have been selected in a formal agency record of decision;

(4) the number of sites that have been fully remedied with environmental technologies tested in the program;

(5) the cost in terms of labor and contract funds expended by the agency on the program;

(6) the estimated number of jobs and increased income associated with the development and commercialization of the environmental technologies tested;

(7) the estimated risk reduced through the use of environmental technologies tested; and

(8) the appropriateness of expanding the program to additional sites.

(f) INCORPORATION OF DEMONSTRATED TECHNOLOGY.—Where practicable, the covered Federal agency shall incorporate the demonstrated technology in the prevention, control, or remediation of contamination at applicable sites.

(g) FUNDING.—Evaluations conducted by the Administrator under this section are eligible for funding under section 311.

TITLE IV—ADDITIONAL PROGRAMS

Subtitle A—Verification of Environmental Technologies

SEC. 401. PROGRAM.

(a) ESTABLISHMENT.—The Administrator shall establish a program to evaluate, verify, and disseminate performance and cost information on environmental technologies appropriate for compliance with regulations promulgated under—

(1) the Clean Air Act (42 U.S.C. 7401 et seq.);

(2) the Federal Water Pollution Control Act (commonly referred to as the "Clean Water Act") (33 U.S.C. 1251 et seq.);

(3) title XIV of the Public Health Service Act (commonly referred to as the "Safe Drinking Water Act") (42 U.S.C. 300f et seq.);

(4) the Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.); and

(5) other laws that the Administrator determines appropriate,

collectively referred to in this section as "applicable regulations".

(b) FUNCTIONS.—As part of the program, the Administrator shall—

(1) accept applications to evaluate environmental technology subject to the guidelines established under subsection (c);

(2) evaluate and verify the performance and cost information on any environmental technology provided by an applicant subject to the guidelines established under subsection (c);

(3) develop protocols, test procedures, and quality assurance procedures to ensure quality, credibility, and comparability of data and information developed by applicants; and

(4) list and disseminate information regarding environmental technology that meets or exceeds the appropriate criteria in the guidelines established under subsection (c) through the clearinghouse established under section 221.

(c) GUIDELINES.—

(1) IN GENERAL.—Not later than 18 months after the date of enactment of this Act, the Administrator shall, after notice and opportunity for comment, promulgate guidelines for the operation of the program.

(2) DESCRIPTION.—The guidelines shall include—

(A) criteria for determining eligibility of applicants to the program, including—

(i) any large business concern;

(ii) any small business concern; or

(iii) any nonprofit group, university, or State or local government entity;

(B) application requirements and procedures for submitting data and information for evaluation and verification, including appropriate specifications, protocols, and quality assurance requirements relating to data and in-

formation development and presentation, including—

(i) appropriate, independently verified, analytical testing procedures to demonstrate compliance with the applicable regulations;

(ii) required data and findings; and

(iii) appropriate equipment or demonstrations;

(C) provisions excluding from verification any environmental technology that causes significant increases in environmental pollution in any media or is determined by the Administrator to have other unacceptable side effects;

(D) general criteria for verification and listing of environmental technologies, including—

(i) compliance with any applicable regulation at a lower cost than the estimated cost of the technology used to establish the applicable regulation; or

(ii) compliance with any applicable regulation with additional pollution prevention, control, or remediation benefits than

the technology used to establish an applicable regulation;

(E) a schedule of fees for applications to cover the costs of the program, including—

(i) a sliding scale of fees based on the category of eligible applicants defined in subparagraph (A); and

(ii) lower fees for applicants defined in clause (ii) or (iii) of subparagraph (A); and

(F) provisions that provide special consideration to the needs of small business concerns.

(d) LISTING OF TECHNOLOGY.—For technologies that the Administrator finds, through the evaluation procedure established in subsection (c), meet or exceed all of the verification criteria established in subsection (c), the Administrator shall publish the results of the evaluation and a description of the evaluated environmental technology and disseminate the information through the clearinghouse established under section 221.

(e) ADMINISTRATION.—

(1) USE OF FEES.—All fees collected by the Administrator through the operation of the program established under this section shall be used to support the operation of the program.

(2) EVALUATION DEADLINE.—All evaluations conducted under the program established under this section shall be completed, and the applicant notified of the results, not later than 6 months after the receipt of a complete application.

(f) NO REVISION OF APPLICABLE REGULATIONS.—Nothing in this section shall be construed to revise any applicable regulation or release any person subject to an applicable regulation from the duty to fully comply with the applicable regulation.

(g) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated such sums as are necessary to carry out this section.

Subtitle B—Environmental Technology Advisory Council

SEC. 411. ESTABLISHMENT.

(a) ESTABLISHMENT.—There is established the Environmental Technology Advisory Council (referred to in this section as the "Advisory Council").

(b) MEMBERSHIP.—The Director shall appoint the members of the Advisory Council. The individuals appointed as members of the Advisory Council shall—

(1) be eminent in the fields of business, research, new product development, engineering, labor,

education, management consulting, environment, or international relations;

(2) be selected solely on the basis of established records of distinguished service;

(3) not be employees of the Federal Government; and

(4) include—

(A) at least 1 representative of a leading consortium of manufacturing and technology firms;

(B) at least 1 representative of small business concerns;

(C) at least 1 representative of a State government;

(D) at least one representative of a local government body; and

(E) at least one representative of a nongovernmental public interest organization.

(c) CHAIRPERSON AND VICE CHAIRPERSON.—

(1) SELECTION.—The Advisory Council shall appoint from among the members of the Advisory Council a person to serve as Chairperson and a person to serve as Vice Chairperson, each of whom shall serve as Chairperson or Vice Chairperson, respectively, for a term of 1 year and shall not thereafter

be eligible to serve as Chairperson or Vice Chairperson, respectively, until 1 year has elapsed after the end of the term.

(2) VICE CHAIRPERSON.—The Vice Chairperson of the Advisory Council shall perform the duties of the Chairperson in the absence of the Chairperson.

(d) DUTIES.—The Advisory Committee shall—

(1) review and make recommendations regarding general policy for the Institute established under title II, and the organization, budget, and programs of the Institute within the framework of national policies set forth by the President and Congress;

(2) review guidelines and regulations of the environmental innovative research program established under title III;

(3) on the basis of the reviews conducted under paragraphs (1) and (2), make recommendations to the Administrator, the Director, and the head of each covered Federal agency regarding the merits of the distribution of the funds under proposed funding agreements to fund proposed projects under the environmental innovation research program established under title III;

(4) establish merit review panels consisting of members with technical expertise and related busi-

ness experience to review proposals for funding submitted to the Institute;

(5) consult with the heads of Federal agencies covered by the environmental innovation research program established under title III concerning the expenditure of funds from programs established under section 311;

(6) consult with the Panel established under title I in the development of the national environmental technology strategy;

(7) review the effectiveness of the clearinghouse established in section 221;

(8) make recommendations to the Director to improve the effective dissemination by the clearinghouse of research information and results; and

(9) make recommendations to the Director regarding administrative actions to promote the export of environmental technologies.

SEC. 412. REPORT BY THE COMPTROLLER GENERAL.

Not later than 2 years after the date of enactment of this Act, the Comptroller General of the United States shall submit to the Committees on Environment and Public Works and Appropriations of the Senate and the Committee on Science, Space, and Technology and Appropriations of the House of Representatives a report concerning

the implementation of the programs established under titles II and III, including a description of the research conducted under the programs.

Subtitle C—Coordination With National Institute of Standards and Technology

SEC. 421. COORDINATION WITH NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.

(a) AGREEMENTS.—Not later than 180 days after the date of enactment of this section, the Administrator and the Secretary of Commerce shall enter into such agreements as may be necessary to permit the Environmental Protection Agency to provide technical assistance and support to the Manufacturing Technology Centers administered by the National Institute of Standards and Technology of the Department of Commerce.

(b) ASSISTANCE.—The assistance shall include—

(1) the preparation of environmental assistance packages for small business concerns generally and, where appropriate, for specific small business sectors, including information on—

(A) environmental compliance requirements and methods for achieving compliance;

(B) new environmental technologies;

(C) alternatives for preventing pollution that are generally applicable to the small business sectors;

(D) guidance for identifying and applying opportunities for preventing pollution at individual facilities;

(2) providing technical assistance to small business concerns seeking to act on the information provided under paragraph (1);

(3) coordinating with the National Institute of Standards and Technology to identify those small business sectors that need improvement in environmental compliance or in developing methods to prevent pollution; and

(4) developing and implementing an action plan for providing assistance to improve environmental performance of small business sectors in need of improvement.

SEC. 422. COORDINATION WITH OTHER FEDERALLY SUPPORTED EXTENSION PROGRAMS.

The Administrator may coordinate with representatives of small business and agricultural extension programs and centers, as appropriate, to provide environmental assistance to small businesses.

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